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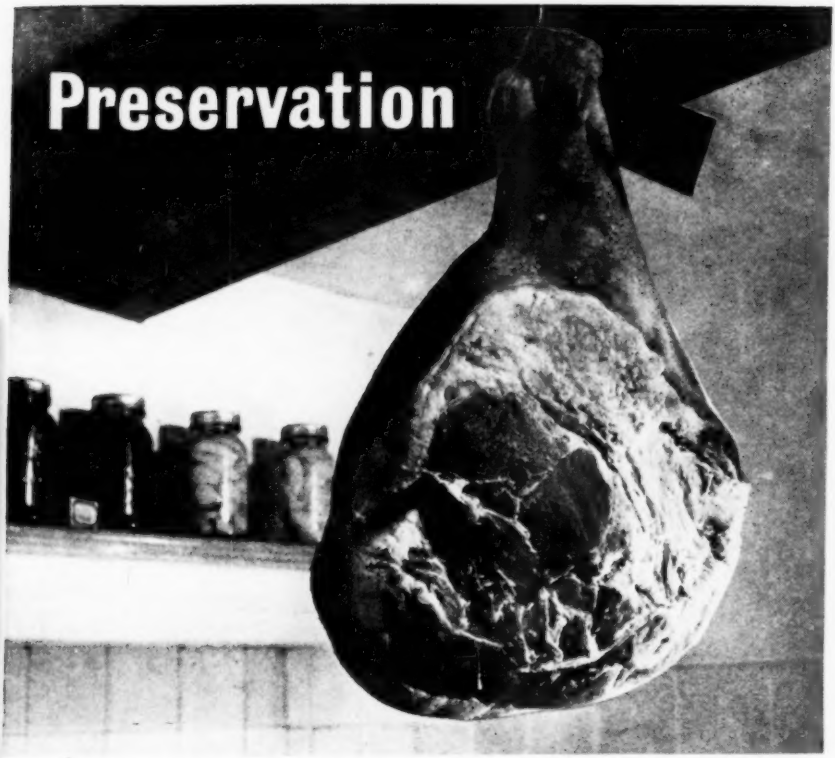

THERE IS a good time coming for all on the farm. More grass is going into silos than ever before. The disastrous hay season of 1950 swung the bias of opinion heavily towards silage as the best means of preserving grass. Grass so preserved is grass changed as little as possible — if the silage is made correctly.

Silage grass for winter feeding cannot be obtained in adequate quantities merely by cutting the surplus growth. It must be grown as a grass crop. Make sure of a good crop by adequate basal fertilization, followed by nitrogen, the vital production factor. Ten days before cutting, apply nitrogen again. The protein content of the silage will be raised, and the aftermath will be quicker and heavier. No wheel damage will result if the work is done while the grass is dry. Then early cutting and good ensiling will ensure adequate animal food next winter.

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Cover Photograph

Harvesting Lucerne near Sundridge, Kent .. .. *H.D. Keilor*

AGRICULTURE

THE JOURNAL OF THE MINISTRY OF AGRICULTURE

VOL. LVIII No. 3 JUNE 1951

THE WAY TO HIGHER CROP YIELDS

SIR WILLIAM GAVIN, C.B.E.

Last month's issue of AGRICULTURE was devoted to the story of Britain's farming progress over the centuries. Sir William Gavin here takes the story a stage further and suggests that we can look for increasing crop yields as the knowledge of research as to fertilizer use, the production of better seeds, and new and improved insecticides, fungicides and weed-killers passes into practice.

AT the time of the 1851 Exhibition our great-grandfathers were producing an average of about 26 bushels of wheat per acre. Earlier records can be taken as only approximate, but I give them as some evidence of the level of production expected in those days(1) :

About 1750	20	bushels per acre
„ 1550	15	„ „
„ 1350	8	„ „
„ 1250	6	„ „

The figure for 1250 is taken from Coombe in Oxfordshire(2). Before the first world war I myself used to farm land in this and in the adjoining parish. The soil is cornbrash with some heavier fields merging into an overlay of Oxford clay. In my youthful inexperience and with the sparse fertilizer dressings then customary, I used to be content with 8–9 sacks per acre. Mr. W. C. Green, who now farms this land really well, tells me that he gets up to 14 sacks in a good season—a noticeable advance from 1½ sacks, even for 600 years.

Over the country as a whole the average today is 36 bushels, with much of our good wheat land yielding 50. Thus recent progress has been as follows :

YEAR	AVERAGE PER ACRE *bus.*	INCREASE OVER PREVIOUS FIFTY YEARS *per cent*	ACREAGE ENGLAND AND WALES
1850	26	13	3,500,000 (est.)
1900	30	15	1,664,603
1950	36	20	2,398,000

Can we go on doing this sort of thing not only with wheat but with other crops ? Will *our* great-grandchildren wonder why we who are farming today, were content with such small yields ? Most assuredly they will : the evidence of history points to it.

The last hundred years have seen more scientific discoveries made available to agriculture than in the whole course of history. Out of the dim past came the wheel, the lever and the plough ; it was a thousand years ago that the value of fallows and of resting land with grass was realized ; it was more than two hundred years ago that the principles of rotational cropping were established. But it was men who were almost our contemporaries

who brought to crop production the benefits of mobile power with its mechanized equipment, of fertilizers, of insecticides and of pedigree seeds, and to these is being added every day a whole range of new knowledge on soil constituents, weed-killers and on plant nutrition. Who can doubt that we are as yet only on the threshold of still greater advances ?

Fertilizers From the viewpoint of crop yields the most important advance of the last hundred years has been the extended use and understanding of chemical fertilizers, or, as they were first called, " portable manures". Ground bones and guano were then the most popular, but in 1842 Lawes obtained his patent for superphosphate, made by treating first coprolite mined in Cambridgeshire* and Suffolk, and later phosphate rock from North Africa. In 1847, 500 tons of coprolite were mined, and this was the total superphosphate production in the world.†

By the opening of the century its use was well established and has continued to increase ever since, except when supplies were scarce during the war and when low agricultural prices reduced the farmers' purchasing power. The following table shows these variations as well as the general increase in consumption of phosphates as superphosphate, basic slag and rock phosphate (expressed in tons of phosphoric acid). Incidentally, figures like these give striking evidence of the farmer's willingness, and indeed anxiety, to spend money (when he has any) to improve his land and grow better crops.

Phosphate Consumption, 1903–50

PERIOD	CONDITIONS	APPROXIMATE ANNUAL CONSUMPTION (U.K.) *tons* P_2O_5
1903–14 (12 yr.) ..	Low prices but slowly improving	191,000
1915–18 (4 yr.) ..	War : supplies scarce	182,000
1919–20 (2 yr.) ..	Farm prices high	232,000
1921–31 (11 yr.) ..	Serious depression	164,000
1932–39 (8 yr.) ..	Slow recovery	172,000
1940–45 (6 yr.) ..	War : supplies restricted	283,000
1946–50 (5 yr.) ..	Farm prices economic	390,000

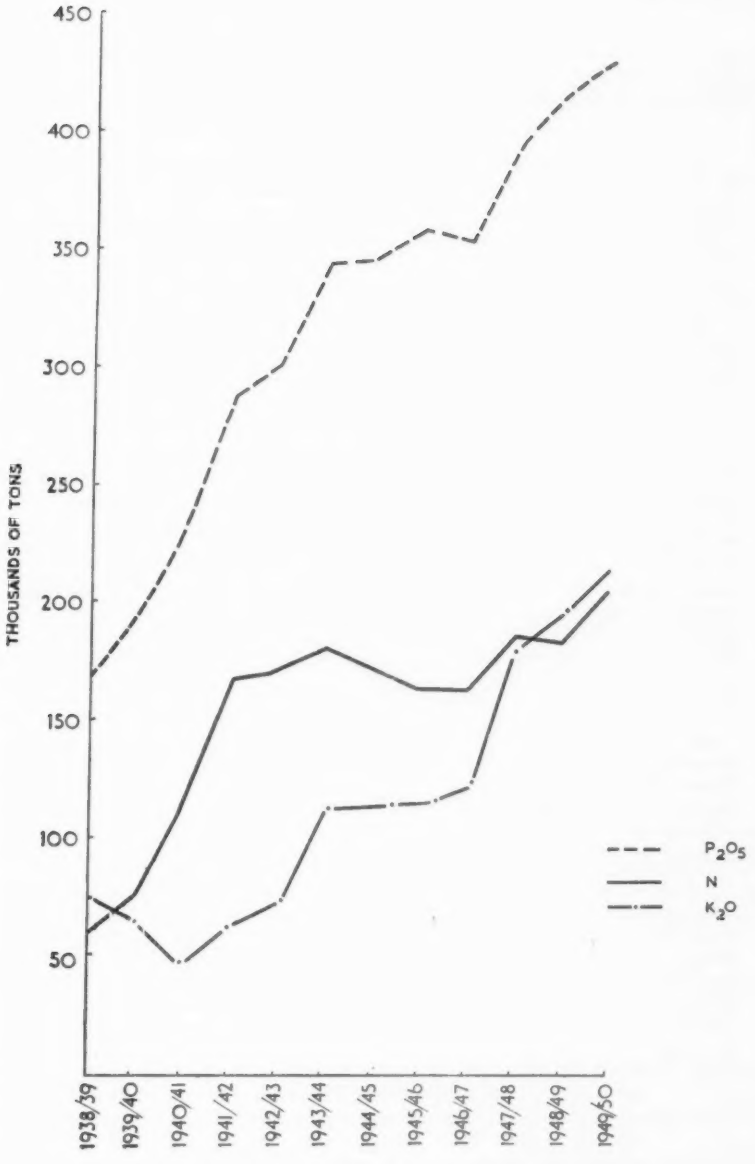
The consumption of nitrogenous and potash fertilizers have also showed a great increase since their introduction. Here are the estimated figures for recent years (for completeness the phosphate figures from the previous table are repeated) :

Nitrogen and Potash Consumption, 1915–50

PERIOD	ESTIMATED ANNUAL CONSUMPTION (approx.)		
	N	P_2O_5	K_2O
	tons	*tons*	*tons*
1915–18	31,400	182,000	—
1919–20	56,800	232,000	—
1921–31	42,100	164,000	43,300
1932–39	59,400	172,000	62,500
1940–45	152,500	283,000	82,000
1946–50	184,600	390,000	165,700
1950	205,000	430,000	214,600

* An article by Miss E. M. Barraud describing coprolite mining in Cambridgeshire during the last century will appear in next month's issue of AGRICULTURE.

† 1938. The world consumption of phosphates was estimated at 24 million tons (expressed as 18 per cent P_2O_5) and is now much greater.



Estimated Annual Consumption of Phosphate, Nitrogen and Potash

It will be seen from the above table that in 1950 the annual fertilizer consumption expressed in terms of plant food* was as follows :

Nitrogen	*Phosphoric Acid*	*Potash*
205,000 tons	430,000 tons	214,600 tons

which gives a ratio (taking N=1) of :

1.0	2.1	1.04

Are these quantities sufficient for a real drive for increased yields, and are the three plant foods in the right ratio one to another ? If not, what will be required ?

There are several ways in which we can endeavour to forecast future requirements. We can use statistical methods for smoothing the curve of the last five years' consumption and prolonging it into the next five years. Or we can adopt the method of Crowther and Yates(3) who, after a study of all published experiments, estimated an " optimal dressing," i.e., the quantity of fertilizer which is most profitable to apply to each crop after making allowance for the cost of the fertilizer and of handling a larger crop. Or again, we can take from practical experience what we think would be reasonable dressings for each crop.

Unfortunately, these methods give somewhat contradictory results. The rapidly rising consumption of the past five years has been influenced by the need to make good the shortage of war, by the subsidy on fertilizers, by relatively high prices of farm produce, and by short supplies of some fertilizers, and other post-war conditions. A forecast of the future based on the past is therefore liable to grave error. A forecast based on the calculated economic dressing for each crop should in theory be the most reliable, but comparatively small changes in prices, either of fertilizers or of crops, which cannot be foreseen, lead to very substantial differences in the total figure. A combination, therefore, of this last method with an appraisal of how far in practice farmers are likely to go towards maximum economic dressings may probably give the best answer.

Many persons have attempted this estimate, but space does not permit of giving detailed calculations here. All are agreed, however, that as regards phosphates and potash, farmers are within measurable distance of economic practice on arable crops, particularly if an expanding livestock industry provides more dung. All are agreed, too, that more nitrogen should be used on arable crops, principally cereals, if yields are to be increased.

It is in connection with grassland that estimates become difficult. The increased use of fertilizers, particularly of nitrogen, on grass is the most important single factor in bringing about any large-scale improvement in home food supplies and in making individual farmers more independent of imported feedingstuffs. The quantity of nitrogen that could economically be used for this purpose is staggering and far beyond the present manufacturing capacity of the country. Yet the use of fertilizers must not outrun the capacity of the agricultural industry to manage intensive grassland, to breed additional stock to graze it, and to utilize to the full the surplus as

* Expressed as fertilizers the approximate figures are as follows :

Nitrogen as sulphate of ammonia	*Phosphoric Acid as superphosphate*	*Potash as muriate of potash*
1,000,000 tons	2,500,000 tons	400,000 tons

good quality hay, silage or dried grass ; extra production, to be economic, must keep pace with full utilization. It is the estimation of the rate at which this can be done that is so difficult.

As a beginning we might well, over the next few years, put 1 cwt. sulphate of ammonia on one-half and 1 cwt. superphosphate on one-quarter of our 18 million acres of grassland, and ½ cwt. muriate of potash on, say, 1 million acres of potash-deficient soils. This would require an additional :

Nitrogen	*Phosphoric Acid*	*Potash*
90,000 tons	40,500 tons	12,500 tons

Allowing for a small increased usage on the arable of 15 per cent N, 10 per cent P_2O_5 and 5 per cent K_2O, this would bring the total requirements to :

Nitrogen	*Phosphoric Acid*	*Potash*
326,000 tons	513,000 tons	238,000 tons

compared with present consumption of :

205,000 tons	430,000 tons	215,000 tons

and would bring the ratio (N = 1) to :

1.0	1.6	0.7

The low ratio of N to P_2O_5 is further evidence of the need for increased nitrogen usage, and the way this fertilizer has lagged far behind the others is further illustrated in the graph on p. 107. The present ratio in Holland is 1.0 : 0.87 : 1.07, and the authorities there are aiming to make this 1.0 : 1.0 : 0.8.

From all the evidence available, therefore, I put more nitrogen, wisely used of course, as one of the important—if not *the* most important—means of achieving higher production.

Better Seeds With the re-publication of Mendel's experiments in 1901, the human race for the first time obtained some measure of control over the vegetable world and could set out to breed the sort of plants they wanted with, say, shorter straw, larger roots, bigger grain, or varieties suited to high and low soil fertility levels, different climatic conditions, varying commercial requirements, and resistance to specific diseases or insect attacks.

" Time has always been the essence of plant-breeding procedure—time to evaluate plant material over a variety of seasons, to obtain the response of new forms to different environments, and to determine their reaction to commercial necessities."(4) In spite of this, progress has been repaid over the last twenty years, and this year, of the samples submitted to the Seed Testing Station, 82 per cent of the wheat, 90 per cent of the oats and 94 per cent of the barley is grown from seed of varieties tested and recommended by the National Institute of Agricultural Botany.

The motto of the Institute is *Better seeds : better crops*, the truth of which cannot be denied. To measure the betterment, however, is not so easy, since increased yield is not always the sole aim. For example, the recent breeding of a winter-hardy 2-row barley and an early-maturing field pea represents an achievement which will result in an addition to the national larder, although not an addition to the yield per acre of the particular field on which these crops are grown. Again, in breeding for extreme stiffness

of straw some concession has been made to yield, but in this case also the end result should be a larger quantity per acre harvested, although not a larger quantity per acre grown.

When testing for yield alone, however, a difference of less than 8–10 per cent is seldom regarded as significant, and taking all these factors into consideration, it would, I think, be a modest estimate to say that in cereals alone better seeds have resulted in better crops to the extent of at least 6 per cent. This would represent 450,000 tons in 1950.

It is encouraging that seedsmen and others have submitted not less than 50,000 acres sown with cereal stock seed for inspection, of which 35,000 acres have been approved. If this stock seed is multiplied for one year before sale it would be sufficient to sow over 3 million acres.

Other Ways to Higher Yields There are other ways to higher crop yields. The new selective week-killers, such as MCPA, DCPA, and DNOC undoubtedly have a great future. They were used last year on about 10 per cent of British cereals. Weeds may well account for some 5 to 10 per cent reduction in the national crop (in some fields up to 20 per cent) and they represent a great burden on labour costs. The success of weed-killers in Italy and Egypt even produced a strike amongst the peasants and felaheen, who saw in them serious competition to their employment.

Then there is the wide range of new insecticides and fungicides of ever-increasing efficiency. Thirty years ago tar oil winter washes were introduced for the fruit grower, and these, together with arsenical sprays, Bordeaux mixture, nicotine and derris long remained about the only chemical aids available for crop protection. The last ten years, however, have seen important discoveries such as DDT, BHC, phosphorus insecticides and the organo-mercurial seed dressings ; these many new weapons are being placed in our hands to fight the attacks of insects and fungoid diseases which will lead to increased over-all production.

The Basic Problem for Rapid Progress But overriding all the factors mentioned in the foregoing pages is the basic problem of converting the pioneering skill and knowledge of the few into the practice of the many—that is to say, into normal farming routine. Progress along the way to agricultural improvements comes in two stages. A few pioneers every now and then hack out a narrow path beyond the end of the road into the jungle of the unknown : gradually this is widened by greater knowledge until it becomes the highway along which the main body of the industry can advance.

This may perhaps sound over-picturesque ; but I doubt if even now it is fully realized that the spread of existing knowledge and of the best practice is the only really rapid way of raising production : new knowledge takes long to acquire and longer still to try out. The spread of existing knowledge is not just one of the many tasks facing agriculture—it is the dominant one: it has dominated farming history for five hundred years and probably for all time : it is the ladder up which civilization has climbed.

Never has progress been as rapid as in the last ten years, and this because the three necessary conditions for it have been ruling :

1. Remunerative farm prices.
2. Security against sudden collapse of markets.
3. Organizations for the spread of knowledge (first the W.A.E.Cs. and now the N.A.A.S.).

All these conditions are outside the governance of farmers. Only their maintenance will secure that the farming industry is able to advance still further along the way to higher crop yields.

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A HUNDRED YEARS OF LIME-SULPHUR

F. G. ORDISH, Dip.Hort., B.Sc. (Econ.)

In 1851 Mr. Grison of France boiled up some sulphur and lime and sprayed the royal grapes at the Palace of Versailles which were threatened with extinction from Powdery Mildew. He made the first lime-sulphur. In the past hundred years the use of lime-sulphur for various purposes has spread throughout the world.

THE year 1951 marks not only the centenary of the Great Exhibition, but also the centenary of another event, which, though it may sound much humbler, was nevertheless to become of great importance to British agriculture. This event was the first use in 1851 by Monsieur Grison of lime-sulphur, the product which eventually became of such importance to sheep farmers and fruit growers.

In the 1840s the age of steam was rapidly developing both in Britain and in France ; new wealth was being created with great speed, and a spirit of enterprise and scientific inquiry was abroad. Plants were imported freely for the purpose of stocking the elaborate conservatories that were considered a necessary adornment to every gentleman's house(1). No thought was given to the possibility of introducing dangerous diseases or insects ; in fact, the nature of the former was very little understood.

The Rev. M. J. Berkeley, at King's Cliffe, Northants, was particularly interested in studying fungi, and specimens of fungi, moulds and mildews were sent to him from all over the world. It was in 1845 at Margate that Powdery Mildew was first noticed on a vine by Mr. Tucker, the gardener to Mr. John Slater.

The First Lime-Sulphur The disease also appeared in France and was particularly bad at the Palace at Versailles, where it started to ruin the choice table grapes in the greenhouses. Monsieur Grison, the "*chef des serres du potager,*" was in charge, and was much concerned about the destruction of the royal grapes ; he did not appear to be any less worried when the grapes became republican in 1848. The disease spread all over France and threatened to wipe out the whole of the vine crop.

Dusting them with sulphur was not very effective, and in the summer of 1851 M. Grison boiled up " sulphur 500 gm., with an equal volume of lime and 3 litres of water," allowed it to settle, drew off the yellow fluid and bottled it. He diluted this to 1 to 100 and sprayed the affected grapes. He had made the first lime-sulphur. The results were so startlingly successful that his superior reported the matter to the *Préfet* of the Province. The outcome was that a commission was appointed in the autumn of 1851, which reported favourably and said that M. Grison should be rewarded(2).

The remedy rapidly became popular and was known as "*Eau Grison*". England was not slow in taking advantage of the new discovery, and the *Gardeners' Chronicle* in July, 1852, had an article on " Grison's Method " of combating the new disease(3). It also suggested the use of this new product for the treatment of apricots, peaches and nectarines.

At the Hull meeting of the British Association for the Advancement of Science in 1853, Dr. Astley Price reported on some very successful results against mildew given by Grison's " penta-sulphide of calcium "(4).

In the pages of the English *Gardeners' Chronicle and Agricultural Gazette* (it did not deal exclusively with gardens in those days) and in the French *Revue Horticole*, can be found numerous articles and inquiries on the control of mildew. It can be seen that although Grison's " hydrosulphate of lime " was very suitable for gardens, it was not a practical proposition for the extensive European vineyards. This was because there was no suitable means of application on a field scale. A garden or a greenhouse could be treated with syringe and bucket, but not thousands of vines or acres of fruit trees. Even so, the *Revue Horticole* was suggesting in 1855 that fire engines should be used with the nozzles suitably adapted with a rose or other device to throw a fine spray(5).

An anonymous correspondent (possibly the chemist Bequerel) suggested that precipitated sulphur, obtained by adding sulphuric acid to the "*Eau Grison*," was a better product, as it was less caustic. Perhaps the fire brigades had found out, what many fruit growers since have discovered, that lime-sulphur rapidly corrodes brass castings.

The vine growers in France obtained a control of the mildew by dusting with flowers of sulphur. In Britain the hop growers found they could control Powdery Mildew with dusting sulphur or lime-sulphur sprays, and they continued to use these remedies even though the brewers and hop factors said that it ruined the fermentation of the beer.

The Phylloxera crisis came to France in the 1870s, and lime-sulphur was found (as one would expect) to be useless. Again in France in 1880 and 1881 the Oidium Mildew of vines was very severe, and the *Revue Horticole* reminded its readers that though the late M. Grison's process was not used and almost forgotten, it was good, and they gave instructions how the mixture should be made(6).

Lime-Sulphur as a Sheep Dip Lime-sulphur was now making itself known in Australia as a sheep dip. About 1851 sheep scab became serious in New South Wales and threatened to wipe out sheep farming, and an act was passed for the compulsory slaughter of scabby sheep. The colony was cleared by this drastic remedy, but when scab again appeared from Victoria in 1863, the slaughter act was repealed and dipping introduced. Two dips were given official approval, though at least one firm was selling a less caustic proprietary product. The official dips were

tobacco and sulphur, and lime-sulphur. Between 1864 and 1890 millions of sheep were cleansed in Australia, Tasmania and New Zealand by the new dip, and the industry was saved(7).

The fame of the new sheep dips spread from Australia to the western United States in 1881. They were taken up in California and Oregon, although the eastern states did not seem to hear of them till much later(8). In California it was used first as a sheep dip, but one day an enterprising farmer used some of this dip on his peach trees against the very severe pest—San José scale. This treatment was so successful that in 1885 it was in common use. By 1890 one ranch, the Rio Bonito in California, was making lime-sulphur on a big scale ; their boiling tank had a capacity of 900 gallons. In Australia the dip was so successful that the important Stock Diseases Act was passed in the early 'nineties.

The product was now reintroduced into Britain from both California and Australia ; the early work of Grison on his vines (which by this time after being Imperial for a while had again become Republican) had been forgotten. In 1898 the Sheep Scab Order which dealt with dipping was passed ; a few years later a Departmental Committee which was set up to examine the scab position stressed the value of the dips in the control of the pest(7).

In the early years of this century the Board of Agriculture (later the Ministry of Agriculture and Fisheries), was much alive to the research work being done in the United States. Visits were made to the States and a number of American methods were subsequently tried out in Britain. Between 1901 and 1905 workers in New York State found that lime-sulphur controlled Apple Scab. Its use on fruit trees in Britain was gradually introduced from about 1906 onwards. Professor Theobald was trying it against scale insects at Wye College, and Professor Salmon at the same institution was, in a series of careful experiments, establishing its value as a spray against the Apple Scab ; this was reported in 1910 and 1911(8).

By 1910 in Britain, and earlier in the United States, commercial firms were making and selling lime-sulphur. The two pioneer firms in Britain were Messrs. Lewis Berger and Co., and Messrs. Walter Voss and Co. They exhibited the new product at the Chelsea International Flower Show in 1912, where their lime-sulphurs were awarded Diplomas of Honour. Farmers rapidly took up the use of this valuable new spray. The Yalding Manufacturing Co. also began production. These three firms turned out the product at the rate of about 800 gallons a week, and the ruling price was about 1s. 9d. a gallon. The majority of it went to fruit farmers, as the sheep farmers did not find lime-sulphur as satisfactory on the wool as some of the proprietary dips.

A certain amount of the spray was made by the " self-boil " process developed in the United States by W. M. Scott in 1907. It used the heat generated by slaking lime with hot water to boil the sulphur/lime mixture for a few minutes. The resulting fluid was of low value, and growers soon turned to the fully boiled product.

The great contribution made towards the understanding and rational use of lime-sulphur on fruit was the discovery by Professor Salmon that the fungicidal action of lime-sulphur depended on its polysulphide sulphur content. He was able to advise growers to buy lime-sulphur on a basis of a guaranteed polysulphide sulphur analysis rather than on a basis of a guaranteed specific gravity. From this point lime-sulphur became an increasingly popular spray with fruit-growers, though its use as a sheep dip began to decline.

A HUNDRED YEARS OF LIME-SULPHUR

Lime-sulphur was made originally by boiling lime and powdered sulphur together in open pots. As far as sheep dipping was concerned, a number of different formulas were put up by various governments as official recommendations. The United Kingdom formula was 18 lb. sulphur and 9 lb. lime to 100 gallons of water. After boiling, the liquor was allowed to settle and was usually adjusted to a specific gravity of 1.3. In this process, a certain amount of sulphur was lost as sludge and as the malodorous and poisonous gas, sulphuretted hydrogen. The first serious study of the chemistry of lime-sulphur was made by Dr. H. H. Green in South Africa(9).

Today lime-sulphur is made in modern plants by a closed, pressure process. Lump sulphur can be used, as the pressure allows the temperature to be raised enough to melt it, and the gas is absorbed by passing it up a lime tower. The absorbed sulphur is then passed back to the next batch and consequently is not wasted. Lime-sulphur is now sold to the Ministry of Agriculture's specification of a minimum content of 24 per cent polysulphide sulphur. There is still some sulphur lost even in this process, as a certain amount of calcium sulphite is formed in the sludge. This loss is just under 10 per cent of the sulphur used.

The Sulphur Shortage and the Future The consumption of lime-sulphur in Britain is large, and up to the present has increased every year. The approximate consumption and prices over the last twenty years are :

Year	*Acres sprayed*	*Approx. price per cask*
1930	59,000	40s.
1940	69,000	82s. 6d.
1950	82,000	120s.

The year 1951, besides being the centenary of lime-sulphur, is also the year when we face a considerable shortage of sulphur. Supplies are assured for the main sprays this year, but unless there is an unexpected change, its use must decline in the future.

There are a number of substitutes. As a sheep dip for use against the sheep scab mite and many other parasites, benzene hexachloride is today unsurpassed. There are also substitutes as a fruit tree fungicide. Among these are dispersible powder sulphur preparations. These, of course, still use sulphur, but avoid the loss of sulphur as sulphite which occurs in the manufacture of lime-sulphur. The use of such substitutes should save about 30 per cent. Another is more promising as a sulphur-saver: it is tetra-methyl-thiuram-disulphide. This is an organic sulphur chemical which gives a good control of Apple Scab, and is also suitable as a seed dressing. Already there are products containing it on sale. It uses only one-half as much sulphur to get the same fungicidal effect as does lime-sulphur(10).

In a hundred years, M. Grison's discovery of lime-sulphur has grown from a garden spraying of a few vines and trees to the treatment of the majority of the pome fruits of the world. At one time it was a major factor in sheep farming, though it is not so today. There is, however, a large demand for it on the sheep farms of Australia. With its centenary it may well, owing to the shortage of sulphur, start to disappear. It has had a hundred years of useful and efficient life ; let us hope that if the "*Eau Grison*" must go, its substitute will be equally successful, and still longer lived.

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CEREAL STRAW

J. A. MCMILLAN, O.B.E., B.SC.

National Agricultural Advisory Service

Cereal straw is sometimes judged on its nuisance value to the combine harvester, but there are many profitable uses to which it can be put. Not the least is the important part that straw can play in feeding and the maintenance of soil fertility, besides its uses as litter, and for clamping and thatching.

BEFORE the introduction of the combine harvester—while the self-binder still reigned supreme—straw was considered an important part of the cereal crop. True, there were seasons when it caused trouble. Laid and badly twisted crops called for extra labour and resulted in a prolonged harvest, but in spite of difficulties, as much straw as possible was harvested in good condition. The bulk was fed or used for bedding, and in seasons when prices were favourable a proportion might be sold.

Harvest practice in those days was seldom varied. Only occasionally was there any departure from the routine, as, for example, when barley might be cut loose or wheat and winter oats for seed might be threshed from the stook. So long as the yards were filled in winter with stores or fattening cattle, a high proportion of the straw was returned to the land as farmyard manure, enriched usually with the residues of purchased feedingstuffs.

In favourable seasons the corn fields early became bare and empty, with short stubbles. Even before the stooks were carted, the paring plough or cultivator might be seen at work, attacking weeds weak with the shading and competition of the corn crop and placing surface weed seeds in a tilth to encourage them to germinate. Some found that even the troublesome seeds of wild oats so treated and then ploughed under a shallow furrow could often be induced to germinate. The young plants could then be destroyed while preparing for the following spring crop.

The first real challenge to the old methods came in the 1920s, when corn prices relative to costs of production fell sharply. Could we continue to justify the high cost and heavy labour requirements of a harvest mainly

gathered by manual work ? Was it always necessary to cart and stack grain and straw and subsequently take the latter possibly a longish journey to make it into farmyard manure ? There were clear indications that changes in harvesting methods were coming fast, particularly in the intensive corn-growing areas. Now, we have reached a transition stage, when each harvest sees some slight variation in method and when progressive growers are looking for a flexibility of practice to meet the wide range of harvesting conditions.

The combine harvester was developed to deal with light crops of wheat under conditions where straw was considered to be of no value. It was not surprising, therefore, that the earlier models used in this country failed to give the care-free service that was hoped for. Their appetite for grain was distinctly limited, and they were unable to deal successfully with more than a little straw. They were also ill-adapted to work in laid crops and to meet the widely varying weather conditions of an English harvest. Modifications of design have helped to overcome some of these difficulties, but there is still a wide field for further adaptations.

The combine has, however, gone far to solve a number of the earlier problems. Harvesting costs have been reduced and the greatly extended corn acreage of recent years has been harvested without extra labour. But several new difficulties have arisen, and some at least are unlikely to be solved easily. Grain drying and storage have become the interest of most farmers who own combine harvesters, whereas formerly they were mainly the concern of the buyer or merchant. Straw management is more complex than in the days of standard practice. Nor is it so easy to start the first cultivations for a new crop if the bulk of the straw of the old crop is still standing or is lying on the ground in irregular rows.

Farm grain drying and storage are very much matters for study on the individual farm. Recent experience has shown that we cannot look to any one particular method as the most convenient and economical. Much serious thought, however, is being given to the problem and already a number of ingenious adaptations of buildings and equipment have been made to suit the varying needs of small and large farms.

Rather less attention is being given to the management of straw and its most effective use. Though so much less valuable than the grain, it is of importance in maintaining soil organic matter and as a supplement to phosphate and potash fertilizers. Indeed, the straw of cereal crops of England and Wales in any one year may well contain the equivalent of 75,000 tons of superphosphate and as much as 15,000 tons of muriate of potash, though not in so readily available a form. There is certainly reason to give careful thought to its production, use and influence on soil fertility.

Production and Management The production of straw has not been looked upon as of outstanding importance in the making of new varieties, though feeding quality, particularly in oat straw, is a most desirable character for late and outlying districts. Recent plant breeding work on cereals has centred on high grain yields, early maturity and stiffness of straw, and now reliable varieties of the three main cereals are available both for autumn and spring sowing.

There are advantages in making a choice of varieties for a particular farm on a wider basis than their expected grain yields. The spread of seeding time to cover autumn and spring and the choice of stiff-strawed varieties of

differing maturity dates will tend to lower labour peaks, reduce grain losses in the field and afford better opportunities to deal with the straw. The cereal leaflets of the National Institute of Agricultural Botany, which are published annually, contain information on the range of suitability of the most promising varieties and are a useful reference in deciding which to grow.

There is a growing appreciation of the value of the ley in the modern crop rotation, and its quick and successful establishment is therefore viewed with increasing interest. Undersown cereal crops should be harvested with an eye on the developing ley. The removal of the corn crop is a shock to the young seedlings but gives them a better opportunity to grow before the onset of the first autumn frosts. To aid the ley's establishment, the crop should be cut or combined as early as possible and the straw dealt with quickly to remove its shading effect. Especially on the lighter lands, a turn of the Cambridge roll will help to firm the soil round the crowns and roots of the plants and ensure a fuller stand.

Straw is of value on the farm as feed, for thatching and root clamping, for litter and for ploughing in. There is a need to restate these simple facts, if only to balance the tendency of thinking solely of its nuisance value to the combine harvester. Clean, well-harvested straw is a useful bulky food when used as part of a store ration and, whether cut by binder or combine, should be harvested with an eye on its feed value. For thatching or strawing clamps long wheat straw is preferred and should be provided from a tidily stacked carry-over from the previous year. It may be necessary only to cart a proportion of the straw intended for litter. Much can be trampled into the land by cattle, or by sheep folded on or running over a fodder or root crop, or on seeds to be ploughed up. There are possibilities here of saving transport and labour, provided sufficient are employed to ensure an even spread of straw over the land.

The ploughing-in of straw direct presents a number of problems, especially if the aim is to bury it completely, and not to leave exposed portions to carry over troublesome foot rots. For straw on long stubbles, chopping and spreading behind the combine will assist, and the treading by livestock will further help. When the combined straw has been removed but a long stubble remains, rolling may help in some cases ; in others, disc harrows or a multi-disc plough set for shallow work can prove effective as a preliminary to ploughing later and have the advantage of inducing weed seeds to germinate. The making of a clean surface for ploughing by burning the straw is of course tempting, but such a source of organic matter once destroyed cannot easily or economically be replaced. Even if all the available straw of a normal crop rotation were used to make farmyard manure, it would provide only enough to give a 10 to 15 tons per acre application once in five or six years.

Influence on Soil Fertility Soil fertility is closely linked with the organic matter content of the soil, and we might expect then that straw would play an important part in its maintenance. For some twenty years, experiments have been in progress at Rothamsted and the Norfolk Agricultural Station to test various methods of returning straw to the land. The non-return of straw has been compared with straw as farmyard manure, as raw straw and as composted straw. Interim results have shown the value of farmyard manure and also its residual effects after the first crop, and have emphasized the advantages of a mixed farming system, in which a profitable livestock enterprise can play an essential part in securing high crop production and in building up soil fertility.

The response to ploughed-in straw was rather surprising, for earlier observations on that treatment had been rather disappointing, particularly in regard to the first crop. The actively decomposing straw was found to absorb available soil nitrogen and through a temporary shortage of this essential plant food, to depress the yield of the first crop. The treatment eventually adopted and recommended to overcome this deficiency consisted of adding extra sulphate of ammonia to the normal fertilizer application in spring. The trial results of this treatment have so far been most promising and in a number of seasons were almost comparable with those from farmyard manure, both in the first and second crops. Composted straw and certain green crops ploughed-in were much less effective. It should be noted that the above treatments were supplemented by fertilizer applications to ensure sufficient available nitrogen, phosphates and potash. Nor is there any suggestion in the trial reports that these bulky organic manures should be used without suitable fertilizer supplements.

We know only a little of the story of the action of organic matter in the soil. It has an influence in improving physical condition and in assisting to maintain soil moisture within root range during periods of drought, but we are less certain about its action in restricting phosphate "fixation," about its relative value on different soil types or on the question of how deeply it should be buried in the soil. Work on these lines is proceeding both at soil research centres and the Ministry's experimental husbandry farms. For example, at the latter the effects of no straw, of straw burnt, of straw ploughed in *plus* extra sulphate of ammonia and of farmyard manure are being tested on sand, clay, chalk and silt soils.

Meantime, let us reflect on recent experimental work and its application. The age-long faith in the value of farmyard manure has been confirmed. Especially at present, an increased supply of farmyard manure as a by-product of beef, bacon or pork production should be in the best interests alike of farmer and consumer. Now that the mechanization of handling and spreading farmyard manure has advanced so far, it is hoped that many who, because of high labour costs, abandoned the practice of making yard manure, will again review the position. Where it is difficult or inconvenient to use straw in that way, the ploughing-in of straw with sulphate of ammonia can be advised as an approved practice. But we should not forget that the full benefits of these organic manures are obtained only if used in conjunction with suitable fertilizers.

The evidence now available suggests that only under exceptional circumstances should the selling or burning of straw find a place in a sound farming system.

Correction

"*Vegetable Seed Production in Holland*," February, 1951, issue : page 532, para. 5, line 2.

The Director of the N.A.K.-G. is Ir. G. T. Grooters, not Ir. J. Siebenga, who directs the N.A.K.

TRIAL AND ERROR

R. L. FORREST

Mersington, Greenlaw, Berwickshire

In 1938 Mr. Forrest transported his herd of Ayrshires from Edinburgh to a grass farm in the Merse of Berwickshire. His account of the ensuing and unexpected problems and how they were tackled by the commonest of all farm methods—trial and error—will be read with understanding and interest.

AFTER a winter such as we have just come through, when each day vied with the one before in drabness, the ten days in November, 1937, which elapsed between my first view of Mersington and its becoming my home now seem like a fairy tale. In fact, had Mersington not been all in grass, I doubt if I would ever have taken it, but there is something much less formidable to the canny Scot, brought up on a marginal dairy farm, about a bit of grass, and in that week I doubt if I even once felt that I might not be successful! I knew that conditions would be very different, and that I should have much to learn about cropping, but I knew, also, that my dairy cows would be a comparative novelty in the Merse of Berwickshire, and, with a flock of ewes would reduce considerably my dependence on arable farming.

It was only after the fall of the hammer that the many problems really took shape. In a typically feeding farm steading, where could a byre be built most effectively ? What about water for sixty cows, and what about drains ? As things turned out, I have no reason to regret the decision which circumstances appeared to force on me at that time—that the cows would require to occupy the cattle courts and be milked in a parlour. I had the good fortune to find in the local Medical Officer of Health, a man of considerable vision. No doubt he realized how many would be the snags if a cowshed were built at Mersington—water, drains, and midden—to mention only a few, and also how useful would be the system if it succeeded in a county where milk was scarce.

" Per ardua . . ." By November, 1938, all was ready (or, at least, I thought it was) to receive the herd of Ayrshire cows, whose certified milk had to continue to reach the consumer in Edinburgh without a break. Some fifty cows in milk, complete with horns and an average share of Ayrshire nerves, were transported sixty miles and discharged into four yards. The pandemonium which ensued beggars all description ! By the second evening exhaustion began to bring peace—but not milk. The yield had fallen from 150 gallons per day to 60. Possibly it might have risen if I had had patience to wait, but, with two animals already seriously hurt, drastic action seemed called for if the yard system was not to prove a failure with Ayrshires. I phoned the vet. and within two hours it was all over. My beautiful Ayrshires had lost their horns ! Next morning the yield was a good bit up, and it continued to climb steadily until a yield was reached not unlike what we had been having in the byre.

By this time a large number of snags and errors had become apparent. Chief among them was the lack of individual tying in the yards, even though all the concentrates were fed in the milking parlour—a practice which has long since been abandoned with great advantage. Another factor which detracted considerably from success in those early days was the presence of too many sharp corners, on which cows frequently knocked themselves.

There was also much cleaning up of passages, as caution made me careful about bringing the cows' living quarters near the milking parlour. A licence was essential if the retail side of the business was to prosper.

The difficulties were, however, eventually overcome, although looking back on these early years it seems now as if new ones were for ever cropping up. First a simple yoke arrangement was fitted along the troughs, thus giving some degree of individual control of the maintenance ration ; then divisions were made in the endless concrete troughs, and finally the Scotch byre type of square fireclay trough was provided for each cow, with raised concrete between. Only then did we really have the power to control in a 3-foot space what each cow ate. All sharp corners in the yards were eliminated, and best of all, the journey to milking got shorter and shorter, as we cautiously brought the walls of the yards nearer the parlour. This reduced work and increased housing space.

It was not until 1945, however, that a change of management in the dairy brought the opportunity to abandon the feeding of concentrates during milking. This I now consider one of the biggest improvements introduced. It was done in June, and so accustomed were the cows to coming to the "bait," that a considerable battle had to be won, with the usual effect on yields. However, it was won, and I now have the pleasure of seeing my cows wanting to be milked, and not being bribed ! The improved temperament which results is obvious to anyone who has known both methods.

Other very successful changes made at this time were the introduction of the principle of quick milking, and of a roster system of time-off for the dairy staff. Both have stood the test of time, which is a fair indication of the value of any idea.

There is, in the yard system, a slightly greater tendency for cows to grow "hoof," although there can be no doubt that it is hereditary and that certain families of cows—good milkers included—do not grow hoof. To control the growth, it is now our custom to deal with all those that require attention during their first days at grass. The cows are slung so that the under-side of the foot may be exposed. The best tool is undoubtedly a wood chisel, though a portable electric grindstone with a rough stone is a speedy and agreeable tool for the job.

Food Plans However suitable the buildings and system, milk production can be successful only if an adequate supply of suitable food for the cows is available. The many trials and frequent errors in my food plan, are, I think, some justification for the satisfaction I now feel with present results. With the farm all in grass, the original idea was to "grass" farm—there was no great attraction in cropping in 1938, and the introduction of a dairy was making serious inroads on the already scarce staff housing accommodation. A grass drier, capable of an output of 6 cwt. per hour, was installed, and the cows' feed for a year or two was based mainly on dried grass. I was too much of a Scotsman, however, to feel happy feeding dried grass to my cows in such lavish quantities when the price of that commodity soared with war-time shortages. In spite of all that economists would have us believe, I still felt inclined to charge market value for the grass the cows ate. Such an attitude was bound to cause a search for a cheaper cow food, and, with war-time ploughing-up, I reverted to a much more typically east-coast arable system of feeding : kale and hay in the autumn, then beet tops, followed by swedes, and then mangolds. There was, of course, the inevitable "shake" that accompanies most changes, however

gentle, and a good many changes in weather also. Frozen beet tops or swedes were far from being the ideal milk producer. I still dried grass, but it was treated more as a concentrate, being molassed and fed in a meal ration with oats, beans, etc.

As other overheads in the dairy went up, I began to feel that high yields must be obtained but could not see how this was to be done with the existing feedingstuff position, unless I stopped using the cows as scavengers to clean up after an arable rotation. In other words, I was thinking back to the big yields I got when feeding masses of dried grass, but I wanted something cheaper if I could get it.

Increased sugar beet growing was causing a labour crisis at singling time, and it was not without some misgiving that in 1948 I decided to make into silage a bit of grass that looked like getting away from the drier. So impressive were the results of some trials I carried out with the small quantity of silage available that winter, that I felt we had found the answer—a high quality, inexpensive maintenance food which would greatly ease the production of the high yields aimed at. The cows are now having 60 lb. of silage per head, per day, in three feeds. Apart from some difficulty with a lucerne-cocksfoot mixture (which because of its tendency to sour, we intend to dry entirely this season), the system has been so far almost foolproof. I am continually being told that the cows will some day suddenly go right off silage, that they will loose their "middle," or that their livers will suffer. Possibly one or all of these disasters may befall, but at any rate we have the benefit of a daily half gallon more per cow than could ever have been reached on roots and hay. At the same time, we have deliberately shortened lactations, so that the output may be maintained at its highest level. This means that there is less over-feeding, as no cow giving less than 2 gallons daily is kept in milk. That 92 cow and heifer lactations could average 1,000 gallons at 3.9 per cent fat in only 270 days is, I am convinced, sufficient evidence that the yard system, in suitable circumstances, is not incompatible with high yields.

Mechanization Snags So much for the dairy. I would like to think that the efforts in mechanization had reached a similar standard of success, but when I look in my implement shed at the various misfits there, I cannot help wishing I had sometimes been a little more conservative. There must be few farms, indeed, in Scotland, where soil conditions are such that one machine can be expected to suit the whole place. Take, for example, the potato harvester I was tempted to try. It did well enough in one field to persuade me to " have a go," but the next year, with a different season and a different field, it was not recognizable for the same machine.

The same trouble, although not so drastic, affects the mechanization of the sugar beet. Soil conditions—frost coming out, and many other factors which an enthusiast tends to overlook when buying—make a hash of the most attractive output-per-day figures with which the keen salesman assaults the unwary farmer. Anyhow, I have made a vow to go very cautiously, especially in these days of high prices, in any further adventures with machines to work in or with the soil.

I have nothing like the same fear of mechanizing the crops that grow above the ground. Generally speaking, it is possible to count on fairly similar conditions between one field and another, and also one season and the next. My combine, new in 1942, while it may have done rather better one year than another, has never failed to do the job. There are still some answers

missing, as, for example, to the question of using the same self-propelled machine to swathe the grain as later threshes it. This would make for much tidier and speedier work, and add greatly to the usefulness of a rather expensive machine. Grass is another crop which lends itself admirably to mechanization, but, having learnt my lesson with potatoes, I am trying to be a little more cautious this time, and let someone else find the snags ! My old green-crop loader, early successor to the cutlift of 1938, is still a faithful servant, and I shall want to be assured of the same reliability before I change to a more elaborate machine.

At present I am feeling my way with some beet-top silage, and judging from the effect on a bunch of bullocks, it may be a good line, especially as I think this, too, is a job which can be completely mechanized.

For the future, I look forward to the peace of mind which I shall feel when we have a county water scheme, and to the added flexibility it will bring to the system at Mersington. No doubt, life would lose interest were it not for the continued " trial and error " by which alone we really learn, but it certainly is very pleasant to be able to dismiss a problem in the knowledge that for some years, at least, it should cease to worry us. Such, I feel, is the position in the dairy. To be sure, there still are plenty of problems, e.g., winter sterility and summer mastitis, but within wide limits, the same standard should be possible next year. Whatever one's regrets, however, there can be little doubt that the thrill of having tried, even unsuccessfully, is ample compensation for the many disappointments.

PEA GROWING IN HOLLAND AND BELGIUM

1. GENERAL HUSBANDRY

J. D. REYNOLDS, N.D.A., C.D.A. (Hons.)

Home Grown Threshed Peas Joint Committee

Mr. Reynolds visited Holland and Belgium in 1950 on a fortnight's tour. In this article he records his impressions of the pea-growing areas of the Low Countries, with particular reference to the utilization and distribution of the crop and cultural practice. In the August issue of this JOURNAL, Mr. Reynolds will describe something of the research and advisory organizations in Holland and Belgium concerned with this important industry.

PEA growing occupies an important place in the agriculture of the Low Countries, particularly in Holland. Most of the crop consists of varieties for human consumption—threshed peas and fresh peas for canning—and in Holland a large part of the total production is harvested as seed for export. In 1949 approximately 51,550 acres of such peas were grown in Holland, and 21,100 acres in Belgium ; the corresponding figure for England and Wales was 205,586 acres.*

* Holland and Belgium each comprises only one-fifth of the land surface of England and Wales, and less than one-quarter of England alone.

Types of Peas and Utilization Most of the threshed peas grown belong to the class known as Large Blues (frequently called Dutch Blues in Britain, as all were bred in Holland) and are typified by such varieties as Rondo, Unica, Servo, and Mansholt's G.E.K. About 17 per cent of the Dutch threshed pea acreage in 1949 comprised marrowfats, with Zelka as the most important variety. Few marrowfats are cultivated in Belgium.

Marrowfats are grown mainly for the export trade in Holland, both for consumption and seed. A high proportion of the Large Blues is canned fresh ; others harvested dry, sold loose, are bought by housewives for making into soups, rather than as a vegetable. Large-seeded varieties of Maple and Dun peas are preferred as a vegetable in Holland. Threshed peas are also canned as " processed " peas. Besides a proportion of Large Blues, some horticultural vining pea varieties are cultivated for fresh canning and quick-freezing, the most popular being Kelvedon Wonder (early), Onward (mid-season), and Stratagem (late).

In Belgium, vining peas seem to be of greater relative importance than threshed peas (though not in terms of acreage), the area sown being almost double that of Holland in 1949. Most of the peas consumed are horticultural varieties canned in the fresh state. Great importance is attached to size, small peas being in greatest public demand. Varieties commonly grown include *Nain hâtif d'Annonay*, *Chemin Long*, *Roi des Conserves*, *Serpette Cent pour Un*, Kelvedon Wonder, Prince Albert, Caractacus and Alaska. Most of the threshed peas cultivated are Large Blues, Unica, Mansholt's G.E.K. and Rondo being in demand for the split pea trade. Most are consumed in the country as whole or split peas, but some (e.g., Unica) are canned fresh, as in Holland ; no peas are "processed" canned.

Geography and Distribution of Crop The climate of the main pea-growing regions of Holland and Belgium is similar to that of the important pea-growing area of the eastern counties of England. The annual rainfall in Holland is a few inches more than that of eastern England (max. 31.5 inches), while in Belgium about 32 inches falls where most of the peas are grown. The mean summer temperature is usually several degrees higher in the Low Countries than in England, particularly in Holland. The winters are colder in Holland, so that the Dutch climate may be described as being slightly more extreme than that of Belgium and England. Table 1 shows the acreages per province in Holland in 1949 in relation to the predominating soil types.

Considering soil types, most of the peas are grown on sea silt and on the sandy soils of Noord-Brabant. The islands of Zeeland represent the most important region for marrowfats.

There are certain low-lying areas in Belgium comparable with the terrain of Holland, but as a whole the country is topographically very different from its neighbour. The best agricultural land is the area of alluvial silt north of the Meuse, while the most intensive agricultural region is the broad belt of land running east-west embracing the locality called *Hesbaye*. West Vlaanderen, Brabant and Antwerpen are, in that order, the three most important pea-growing provinces. About 85 per cent of the threshed pea acreage in 1949 was grown in West Vlaanderen, which was also the second most

Table 1

Holland : Approximate Pea Acreages (1949) and Soil Types

Province	Predominating Soil Type	Threshed Peas		Vining Peas*	Total
		Marrowfats	Large Blues		
Groningen	Sea silt	40	10,693	494	11,227
Friesland	Sea silt	54	793	124	971
Drenthe	Sandy	2	190	62	254
Overijssel	Mixed†	64	1,606	494	2,164
Gelderland	River silt	25	1,761	247	2,033
Utrecht	Sandy	62	515	309	886
Noord-Holland	Sea silt and fenland peat	1,010	5,046	1,235	7,291
Zuid-Holland	Sea silt and fenland peat	1,702	4,817	556	7,075
Zeeland	Sea silt	5,110	5,533	247	10,890
Noord-Brabant	Sandy	153	7,247	618	8,018
Limburg	Sandy loam and loess	2	739	—	741

* Estimated. † Intermingled areas of sand, silt and reclaimed excavated peat.

important province for vining peas. Provincial acreages and soil types in 1949 in Belgium are shown in Table 2.

Table 2

Belgium : Approximate Pea Acreages (1949) and Soil Types

Province	Predominating Soil Type	Threshed Peas	Vining Peas*	Total
Antwerpen	Sand and gravel	447	1,482	1,929
Brabant	Clay	410	2,223	2,633
West Vlaanderen	,,	11,011	1,729	12,740
Oost Vlaanderen	,,	795	1,482	2,277
Hainaut	,,	128	247	375
Liege	"Rocky, poor and thin"	57	247	304
Limburg	Sand and gravel	27	247	274
Luxemburg	Moorland	17	—	17
Namur	Calcareous	74	494	568

* Estimated

Farm Practice The size of farm in the Low Countries varies from small-holdings of a few acres up to, for example, the large Dutch polder farms which may be several thousand acres and employing several hundred workers. More than 40 per cent of the holdings in Holland are less than 12 acres. Mixed farming predominates in both Holland and Belgium. In Belgium there is a tendency for threshed peas to be cultivated by larger growers, and vining peas by smaller growers. Quite a number of the canneries are situated on farms where suitable crops for canning are grown. In order to keep the plant constantly supplied, the balance of requirements is obtained from farmers in the neighbourhood, who grow the crops on a contract basis, the canner normally providing the fertilizers and seed. A typical farm-cannery combination might handle, say, 300 acres of peas and 300 acres of other crops in a year.

In the rotations practised in the Low Countries peas occur once in four to ten years ; once in six to seven years is very common. A customary


HOLLAND & BELGIUM
N
GRONINGEN
FRIESLAND
DRENTHE
NOORD HOLLAND
OVERIJSSEL
AMSTERDAM
GELDERLAND
UTRECHT
ZUID - HOLLAND
NOORD - BRABANT
ZEELAND
CAMPINE
LIMBURG
ANTWERPEN
LIMBURG
OOST - VLAANDEREN
WEST - VLAANDEREN
BRUSSELS
BRABANT
HESBAYE
SAMBRE - MEUSE
LIEGE
HAINAUT
NAMUR
LUXENBURG
SCALE OF MILES
0 5 10 20 30 40

rotation in Belgium is : sugar beet or potatoes, wheat, flax or barley or peas, oats or barley. In some districts the order of cropping is traditional ; in the *Hesbaye* region, for example, the classical four-course rotation is : sugar beet, oats, wheat or peas, peas or barley. A long rotation prevents the build-up of soil-borne diseases, a matter of particular importance in Holland where *Fusarium* diseases are rife on the so-called "Western Clay" (sea silt) soils of Noord-Holland and north-west Brabant. Pea growing became very hazardous in these districts, but special disease-resistant varieties have now been introduced.

The land is usually ploughed in the autumn to a depth of 10–14 inches for peas (though it may be less), then left until spring, the winter frosts helping to ensure a good seedbed. Fertilizers are applied either broadcast or by distributor. In Belgium a dressing of about 6 cwt. per acre basic slag in the autumn is commonly applied. Potash, frequently in the form of sulphate of potash, and phosphate are given if required, together with nitrate of soda or nitrate of ammonia, a heavier rate of nitrogenous fertilizer being given on poorer soils. Potassic and phosphatic fertilizers are usually broadcast some time before sowing the seed ; if nitrogen is given it is applied after sowing. On the reclaimed polder soils in the extreme north of West Vlaanderen a complete fertilizer dressing is normally given and ploughed in during the winter. A nitrogenous fertilizer is occasionally applied in the spring, its main purposes being to give the crop a good start and to help it grow away from damage by the pea weevil (*Sitona* sp.). Belgian trials have, like those carried out in this country, revealed the importance of potash for peas.

The practice in Holland is usually to broadcast the fertilizers a day or so before seed sowing. The dressing per acre might comprise 6 cwt. superphosphate and 2–4 cwt. muriate of potash (40 per cent K_2O), with perhaps a little nitrate of ammonia. Sometimes the nitrogenous fertilizer is applied as a top dressing two to three weeks after seeding, when the peas are beginning to emerge.

Sowing. Threshed peas in Holland are sown as soon as the land is in suitable condition ; most are drilled in March. In Belgium the crop is sown in February and March, mainly the latter. With the vining peas, there are early, mid-season, and late varieties. Moreover, several sowings of a variety are normally made, in order to spread the fresh pea harvesting season over as long a period as possible.

Most peas are sown with cup-feed type drills. A popular kind has an arrangement whereby the individual cup size can be altered by a lever, so making it suitable for sowing all types of seeds, from brassicas to beans. In Holland, Large Blues are sown at a rate of about 12½ stones per acre, and marrowfats at about 14 stones per acre. The row width varies from 10 to 16 inches. Row widths of 10 and 13 inches are very common, narrow rows being preferred in the north of the country, e.g., Groningen. In this district the crop is sometimes undersown with caraway seed. Under Dutch conditions trials have shown that with shorter-strawed Large Blue varieties, which have a lower tillering capacity than the marrowfats, a combination of high seed rate and narrow rows is necessary for maximum yields.

In Belgium, seed rates vary from 10 to 12 stones per acre for threshed peas, so that in both that country and Holland rates are rather lower than those customary in this country. Row widths vary from 12 to 16 inches, 12–13 inches being very popular. In some localities, vining peas are sown in

wide (16-inch) double rows, with 4 inches between them. A row width of 16 inches is most widely used in West Vlaanderen. In the area north of Antwerp, many of the small crops are planted by sowing the seeds in groups of 5 or 6, 16 inches apart each way. A six-tooth implement is used to make the holes, into which the groups of seed are dropped by hand and covered over. Growers in West Vlaanderen obtain a similar result by using multi-row drills with special seeding units in which the seed flow is intermittently interrupted so as to space the seeds in groups of three or four about 12 inches apart. With a large number of seeds in a "pocket," the method is not economical of seed, but it facilitates mechanical hoeing between the rows and hand-hoeing between the clusters of plants within the rows. The system also ensures a regular plant over the whole field, but it has the disadvantage that the grouped plants do not thrive so well ; they are so close together. The peas are sown at a depth of 1½–3 inches in both countries, and some growers treat their seed with a protectant before sowing to prevent damage by soil-borne organisms.

It is worth noting that no peas are sown at corn width in the Low Countries ; the minimum is 10 inches, which permits of inter-row cultivations. Hoeing by tractor, and especially by horse, is widely practised for as long as possible. Chemical weed control is less in evidence, compared with Britain, but considerable interest is being shown in the use of selective herbicides, particularly DNBP* products.

Pea Pests. The main pea pests encountered in Britain—pea weevil, pea aphid, and pea moth maggot—also occur in the Low Countries, though aphid and moth are not very troublesome in Belgium. Pea midge (*Contarinia* sp.) is another pest which frequently causes damage to peas in the bud stage in Holland ; pea beetle (*Bruchus* sp.) is occasionally serious in Belgium. DDT (dust and emulsion) is used to control these pests. Benzene hexachloride (BHC) has also been used, but incurs some risk of tainting vining peas. Calcium arsenate is used sometimes in Holland for pea weevil control.

Harvesting. As in Britain, the majority of peas grown on a field scale are cut by the ordinary grass mower, usually fitted with spring-mounted pea-lifters. The hand-hook and stick, scythe, or broad deep-bladed "hoe" are used for small areas. In Holland the torpedo-type pea cutter with V-shaped knives and an American pea harvester are used to a small extent.

Threshed pea yields in Holland and Belgium are higher than those obtained in this country, presumably because a large proportion of the peas are grown on soils of high fertility comparable to the fenland silts of the Wash in England. Comparative national average yields are as follows :

	Vining Peas *cwt. per acre*	Threshed Peas *cwt. per acre*
Holland	95.4(1)	17.3(2)
Belgium	25.5–27.8(3)	18.1(4)
England and Wales	32.0(5)	14.6(5)

1. Including pods ; average 1941–50 (*Centraal Bureau voor de Statistiek*). At the fresh canning stage the proportion by weight of peas to pods is almost exactly one third.
2. Average 1945–49 (*Centraal Bureau voor de Statistiek*).
3. Estimated by *Institut National pour l'Amélioration des Conserves de Légumes* (INACOL) ; 81–97 cwt. per acre, including pods.
4. Average 1939 and 1942–49 (*Institut National de Statistique*).
5. Average 1939–48 (M.A.F. statistics).

Most of the vining peas in Belgium, and some in Holland, are grown on contract with canners. There is an open market for threshed peas.

* 2:4—dinitro-6 secondary butyl phenol.

POULTRY-KEEPING IN ENGLAND AND WALES

R. COLES, B.A., Ph.D., M.Sc.(Agric.), M.Sc.(Econ.)

Ministry of Agriculture and Fisheries

The British poultry industry has seen many ups and downs in the course of its history but the difficulties encountered have often proved a spur to the introduction of improved methods. Dr. Coles's brief survey shows the important position held by the poultry industry in England and Wales.

IT is often asserted that the poultry industry of this country is of recent origin, dating, in fact, from the close of the first world war ; like many trite sayings this is largely inaccurate, though it contains a germ of truth. Curiously enough the poultry industry can look back upon a longer history than many other sections of our farming over the past centuries. Almost five hundred years ago English game-cocks had established a high reputation and were in keen demand from most of the then known world ; today the Cornish Game of Britain has a first-class reputation abroad—although for a more peaceful purpose, and is exported to many countries overseas—particularly the New World.

While there is ample evidence that the high quality of British poultry has been recognized over many years, there seems no doubt that fowl, geese and turkeys existed in large numbers long before the first world war. The poultry population of England and Wales numbered over 32 million birds at the beginning of the century ; by 1921 it was slightly below this figure. During the next thirty years the poultry population almost doubled and so gave rise to the popular view that the poultry industry is of recent growth, although in the face of the number of birds kept before 1920, this opinion can hardly be maintained. Although the last two or three decades have seen many changes and innovations, it is well to remember that today there live men who were active in the industry before 1914 and others who are the lineal descendants of the famous standard-bred poultry breeders of the last century who, in turn, had tenuous association with cockers of earlier times. It is well also to remember that these men of the present and recent past have ensured that Britain remained the doyen amongst poultry-breeding countries, as she has in most branches of livestock.

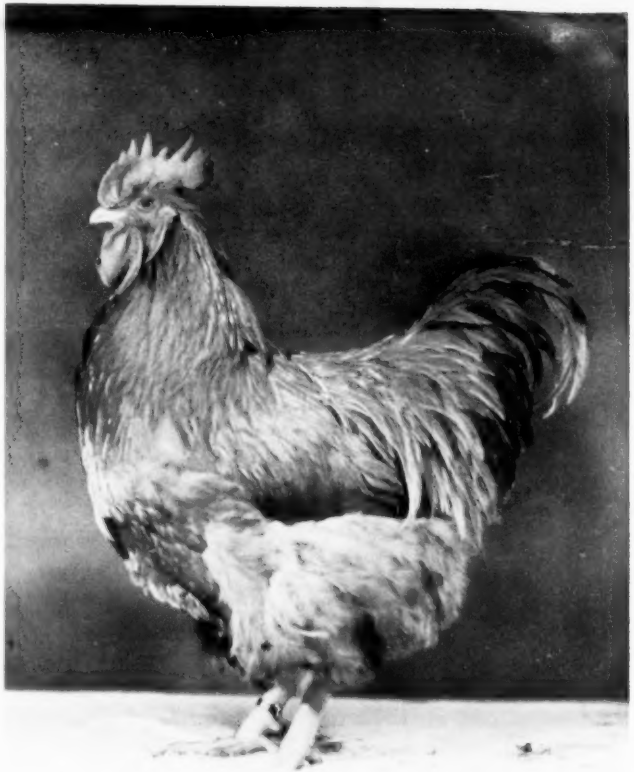
Ups and Downs It is to two characteristics that the poultry industry owes some of its special advantages and disadvantages. The fowl propagates itself with remarkable rapidity and reaches maturity within six months ; and it is small compared with other farm animals. Because of the first characteristic, the chicken has been chosen as an experimental animal on many occasions and, in consequence, knowledge of its nutrition and breeding has reached a high level. The same reason which prompted the selection of the chicken for experimental work allows a rapid expansion of poultry populations under favourable circumstances. At the same time the relatively small value of the individual bird discourages the lengthy treatment of ailments, and numbers may decline through death from disease with even greater celerity. The speed with which the bird can reach a productive stage, allied to its small size, has resulted in an attraction to many persons who are barred by management and equipment costs from directing their attention to larger farm livestock.

In this way our poultry population has been subject to rapid fluctuation in numbers and has attracted, and will, no doubt, continue to attract, large

Photo: *Essex County Standard*

Cafeteria Laying Battery

Indian Game Cock



Buff Orpington Cock

Photos: *Poultry World*

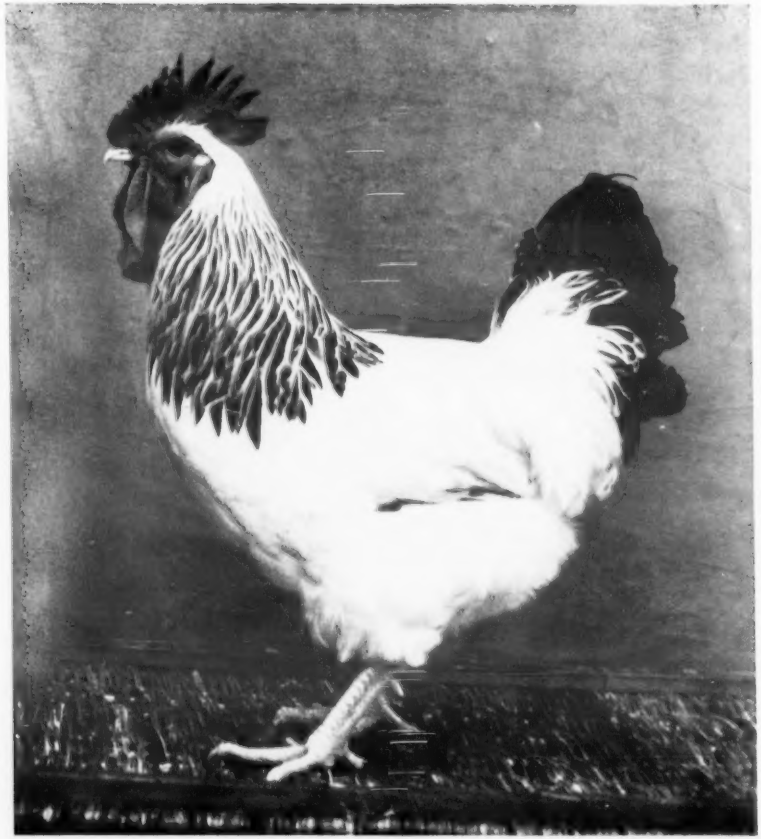
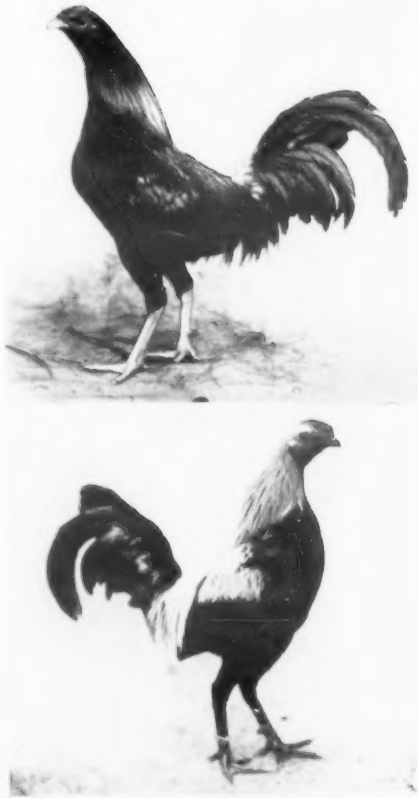


Photo : *Poultry World*

Light Sussex Cock



Photos : *A. Rice*

Old English Game Cocks

JOSEPH PAXTON : FATHER OF THE BRITISH GLASSHOUSE INDUSTRY

(See pp. 132–5)

Joseph Paxton in 1851

(Reproduced from *Paxton and the Batchelor Duke* by courtesy of the publishers, Messrs. Hodder and Stoughton, Ltd.)

numbers of people whose knowledge of poultry husbandry is slight. The temptation to run the "hen machine" at high speed is a recurrent one, since the chicken is capable of amazing performances. Failure to pay due regard to the needs of the bird at these high levels of production may lead to spectacular failure. At the other end of the scale, small poultry flocks have been kept on very many farms and, while producing at a moderate rate, appear able to withstand a considerable amount of abuse through indifferent feeding and management. Indeed in all countries, and even in those where poultry-keeping forms a large part of the agriculture, the small farm flock is the most common unit.

The big increase in our poultry population began after 1920. It is often assumed that the chief reason for the rapid upward trend was the entry of many ex-Service men anxious for an open-air life and prepared to consider only small farm livestock. Many thousands entered it—many with courage and bitter experience stayed—but their specialized units made little difference to the pattern of poultry-keeping which then, and now, remains based primarily on the small farm flock. Certainly a number survived and carried on the high tradition of the British pedigree breeders who existed before 1914, and they continue, in spite of present exigencies, to turn out first-rate stock.

Naturally the more dramatic failures of some of the newcomers attracted attention. The expansion in the size of many flocks and the additions in numbers from recent participants to satisfy an increasing world hunger for eggs, led to heavy demands upon the breeding section of the industry. It was perhaps inevitable that the rapidly expanding need for stock and the presence of a number of unskilled newcomers—and, no doubt, some unscrupulous persons—resulted in frequent cases of failure due to poor quality stock. Much the same pattern of development was experienced in other countries.

The 1930s thus saw a depression in the poultry industry of this country which was paralleled elsewhere abroad. Losses in the industry were high, stamina in many stocks was low, and mortality had grown to alarming proportions. From this time onwards it is possible to follow two clearly marked lines of development aimed at improved standards of poultry-keeping. They have not been unsuccessful, and today in spite of war and post-war difficulties the poultry industry is continuing to play a very important part in this country's agriculture.

Poultry Stock Improvement Plan The first step was the attempt to give recognition to satisfactory suppliers of stock. With this end in view the Accredited Poultry Breeding Stations Scheme was initiated in 1933. Progress at first was slow but during the war and post-war period expansion has been rapid, and today about 60 or 70 per cent of all chicks hatched and sold are supplied by breeders or hatcheries in the revised scheme, now called the Poultry Stock Improvement Plan.

There are some who are critical of the P.S.I.P. This is probably desirable for, if such a scheme is not sufficiently important to provoke interest and criticism, it is hardly likely to be an effective tool. On the credit side there is no doubt that the incidence of disease has been greatly reduced through the operation of the P.S.I.P. ; mortality is certainly much lower than it was fifteen years ago. To the existence of the P.S.I.P. must also be attributed an improvement in the size of eggs Before the war special-size eggs passing through National Mark Packing Stations amounted to about 25 per cent. No doubt the suppliers were mainly the larger and possibly better poultry-

keepers. Today special-grade eggs passing through the Ministry of Food packing stations account for over 40 per cent of the total throughput—yet there is no financial incentive to produce big eggs. Egg size is highly heritable, and it seems likely that the condition in the P.S.I.P. requiring hatching eggs to be of a minimum weight is having its effect on the product of the commercial egg man. It may not be unreasonable to assume that the P.S.I.P. has also played a part in influencing the average egg production of the country, which is now held to be not less than 153 on a hen average basis. This figure compares favourably with the published national average figures of most countries and would no doubt be exceeded substantially on better quality foods.

A Foundation Stock Breeders' Grade based on progeny testing is to be introduced into the P.S.I.P. in the very near future, and a number of the high-class pedigree breeders already carry out family breeding, allied with progeny testing. This practice, based on experience and scientific knowledge, repeats the salient points required by the R.O.M. and R.O.P. schemes of the U.S.A. and Canada, and it is considered that recognition should be given to those breeders following such systems.

The troubles of the early 1930s emphasized to many high-class pedigree breeders that stamina and viability are pre-requisites of sound stock. For that reason egg production alone is not given the great emphasis in Britain that it receives in some countries. Many pedigree breeders customarily carry in their breeding flocks birds which have survived a number of seasons, and the life of a pedigree breeding bird is probably longer and more vigorous in this country than in most others. This is not to say, however, that egg production is low. The average hen-housed production at laying trials in this country approximates to above 190 eggs over 44 weeks. This figure relates to all entries ; the average for the pens owned by the few dozen breeders who steadily figure amongst the leaders normally reaches a hen-housed figure of over 220, while figures approaching and, on occasion, exceeding 300, are also reached by individual pens over a 48-week period.

In one other respect poultry breeders in England and Wales are charateristic—and that is the continued interest in breed type. This is perhaps not surprising with poultry breeders steeped in the tradition of the nineteenth century fanciers. Many of our present breeders are the sons or descendants of those who played a large part in the "manufacture" of the variety of breeds developed during the last hundred years. It may be argued from the viewpoint of the strictly utilitarian poultry-keeper that breed type is of no value. The arguments for and against the necessity of maintaining good breed type will probably be continued inconclusively as long as poultry-keepers go on discussing their business, but the fact remains that many buyers require a high standard of breed type. No doubt, from pride in their business as livestock producers, many breeders have a special interest in retaining standard bred qualifications, and it is therefore possible to buy in Britain stock which is not only highly productive but which is capable of gaining high awards in breed competitions.

New Systems of Management The second main development in the poultry industry of this country since 1930 has been the introduction of several new systems of management. The troubles of two decades ago resulted in an increasing emphasis on health. To most this meant a return to more natural methods, and range systems began to gain ground at the expense of intensive methods. Probably the most notable development at this time was the fold system. During the years

beginning in 1939 the shortage of food available for poultry intensified this trend towards extensive systems—folds and colony houses. It was essential that the birds should eke out their reduced rations with what they could graze and glean. The general farmer, with the need to place increased reliance on home-produced feedingstuffs, took a relatively more active part in poultry-keeping than the specialist with little or no land. Under the impact of the reduction of purchasable animal food, the latter's part in supplying eggs, and particularly winter eggs, was perforce reduced. General farmers who for the most part lacked the skill and knowledge of the pure specialist have shown not unnaturally a greater interest in the extensive system. These methods normally demand a smaller degree of skill for a moderate level of production than intensive systems and often a lower capital outlay. Possibly the more natural methods may have led to healthier flocks. Perhaps the heavier culling imposed by war-time food shortages resulted in the elimination of birds prone to disease. It is, however, generally assumed that the end of the war saw British flocks with increased stamina and improved health, compared with the middle 1930s, but it is obviously impossible to be dogmatic on this point.

There is no doubt that poultry-keeping was a profitable undertaking during the war and immediate post-war years. Latterly the rapid rise in food costs and labour rates has led to a reduced income per bird. This in turn has resulted in a reconsideration of the range systems of management with their relatively high labour charges per bird and an egg production unremarkable for high winter levels—a point of increasing importance with a return to seasonal egg prices in 1949. There has been, in consequence, a revived interest in intensive methods with their lower labour charges per bird, higher output and improved winter production. Nevertheless the belief that these methods lead to weakened stock has by no means disappeared from many poultry farmers' minds, although others believe that, with sound stock from range-reared parents, they can ensure a continued low mortality amongst our commercial flocks under intensive methods.

Under continued economic pressure the trend towards intensive methods continues, and many are operating on the built-up litter system, accounts of which have been brought back by every poultry man who visits North America. In the traditional British fashion the fears already expressed, coupled with the pressing need to reduce labour charges, have resulted in a form of compromise now sufficiently widespread as to require comment. The hen-yard is a system of management akin to the bullock yard for cattle. It has the advantage of the reduced labour requirements associated with the built-up litter system, but combines it with the open air conditions which have been regarded as an essential by many poultry-keepers. At present it must be regarded as still in its experimental stages ; of its popularity there can be no doubt—especially as it involves only low capital costs.

The battery system is probably still regarded as the most usual of the fully intensive systems. Nevertheless the cage-battery has also been affected by the need to reduce labour costs. A development worthy of note here is the introduction of a cafeteria battery, in which the food and water are passed to the birds by a mechanical device requiring only very occasional recharging. Advances in the mechanizing of cage batteries are always being made, and we may expect to see the time when the number of birds managed by one man under this system compares favourably with the impressive numbers quoted for the built-up litter system overseas.

Amongst other recent developments in the poultry industry which invite comment is the establishment of the Poultry Research Centre at Edinburgh—

a research institute with equipment comparable with the standing of the well-known scientists under Dr. Alan Greenwood now stationed there. Lancashire—*the* poultry county of England—has also a special claim with its Production and Progeny Trials—the first trials operating on the basis of a large-scale progeny test.

A Resilient Industry The year 1951 has opened with British poultry-keepers facing increased costs and harder times. To use an expression often quoted about the poultry industry, it is standing at the cross-roads. But the industry has on so many occasions found itself in this situation that it is unlikely to take the wrong turning and, with so many capable men whose names are well known here and overseas, it is equally unlikely that this important section of British agriculture will ever fade into insignificance. Despite ups and downs, the industry, like the bird on whose potentialities it is built, is persistent. Perhaps the secret of this is revealed in Herford's words :

> Alas ! my child, where is the Pen
> That can do justice to the Hen ?
> Like Royalty she goes her way,
> Laying Foundations every day,
> Though not for Public Buildings, yet
> For Custard, Cake and Omelette.
> Or if too old for such a use
> They have their fling at some abuse . . .
> No wonder, Child, we prize the Hen,
> Whose Egg is mightier than the Pen.

JOSEPH PAXTON : FATHER OF THE BRITISH GLASSHOUSE INDUSTRY

C. E. Pearson

Ministry of Agriculture and Fisheries

The glasshouse industry owes much to the creative genius of Joseph Paxton, the designer of the Crystal Palace. Becoming head gardener at Chatsworth, the home of the Dukes of Devonshire, at the age of twenty-three, he took full advantage of the opportunities that the large estate offered. His then revolutionary ideas in glasshouse design and construction have left their mark for all time.

ACCORDING to history, the year 1803 passed quietly along its course without the horticulturists of the time realizing that anything unusual had occurred. Yet on August 3, at Milton Bryant near Woburn, Joseph Paxton was born, the seventh son of a tenant farmer, and the British glasshouse industry as it is today, became possible.

The story of Paxton's life is brilliantly told by his grand-daughter*. The hard, early years and the little education seemed but to lead, as with many another, to greater self-development, but despite this, he remained one of the few who achieve world fame yet still retain the lovable character

* Paxton and the Bachelor Duke. Violet Markham. (Hodder and Stoughton, 1935)

of their youth. Whether as author, publisher, one of the Commissioners who saved Kew for us, traveller, proprietor of the *Daily News*, director of railways, architect, creator of the Great Exhibition Building, Member of Parliament or man of business, he remained, in the words of the Sixth Duke of Devonshire, his great master and true friend, "Paxton, the quite unaltered gardener".

Paxton, the Gardener And it is as a gardener that he captures our hearts. We see him as a young man applying for his first important job and adding a few years to what seemed to him to be a too youthful age—a little deception which is no doubt far from unique but has a flavour entirely its own when practised successfully on so august a body as the Horticultural Society (it was not then "Royal"). And we see the Duke of Devonshire, no mean judge of character among a host of other accomplishments, strolling from his Chiswick home to the Society's gardens next door, and stopping to chat with the " short, pleasant-looking young man " who often opened the gate for him. And then, Chatsworth has a new head gardener. He is barely twenty-three and is to be paid £70 a year.

The morning of May 9, 1826, must surely have been as delightful as the picture that is painted for us. The head gardener arrives at 4.30, and as no one is to be seen, climbs over the greenhouse gate, then scales the wall of the kitchen garden and at six o'clock sets the men to work. There follows breakfast with the housekeeper and her niece. " The latter fell in love with me and I with her, and thus completed my first morning's work at Chatsworth before nine o'clock." How many have found a life partner like Sarah before nine o'clock in the morning ?

The vast estate offered great opportunities. The grounds were large, and had suffered some neglect. Illuminations, fountains and other water-works were the fashion of the day, and there was keen competition for new methods, new garden designs and new plants. The great landowners financed expeditions to all parts of the world, some of them lasting for years but all contributing richly to the stocks and varieties we enjoy today. Paxton organized only one of these, for he could not bring himself to risk a repetition of the tragedy that brought it to an end. He had planned for every eventuality, even to bidding his two young men " beware of bears and women, since both are hindrances to the placid life of a plant collector," but he could not foretell that they would perish when an unruly Canadian rapid engulfed their canoe.

But developments at Chatsworth went on steadily and successfully. The grounds were extended and replanned and made fit for the visits of royalty and the nobility of the land. After a grand display one evening, the Duke of Wellington rose early for the purpose of seeing how the tedious job of tidying-up was being tackled, only to find that Paxton had organized a night-shift. When the famous boots trod the gravel paths all was spick and span.

It is not easy today to realize how difficult much of the work must have been. New and often tender plants had to be raised in glasshouses which would now be regarded as gloomy buildings quite unsuited to their purpose. They were generally of the lean-to type, with walls wholly or largely of brick. The roof timbers were thick and heavy, taking up nearly as much space as the small panes of glass, and the heating was extravagantly inefficient. But under the direction of a gardener who became also a self-taught architect, engineer and builder, change followed change continually. Timbers with

bevelled sides admitted more light and reduced weight, and grooved sash-bars did away with the need for putty. The ridge-and-furrow roof was introduced, and the new sheet-glass was used and the makers persuaded to turn it out in lengths of 4 feet. Heating, ventilation, humidity and the incidence of the sun's rays were all carefully studied, and in 1837 the Great Conservatory was begun. For this no less than 40 miles of sash-bars were required, and for the first time mechanization came into the building of a glasshouse—the grooving was done by machine.

The Victoria Water-Lily But the step that was to lead more directly to fame had yet to come, and its telling has an excitement all its own. The Victoria Water-Lily could not be made to flower in England, so in 1849 the most ingenious plans were laid at Chatsworth to induce the lady to change her ways. The correct degrees of humidity, warmth and light were provided, a tank 12 feet square was constructed and a water-wheel installed for the purpose of imitating the motion of a tropic river. Even the use of electric light, then very expensive, was considered. When all was ready, Paxton himself fetched a small plant from Kew (no one else could possibly be entrusted with such a care). Within six weeks, the leaves had grown from 5 inches across to more than 3 feet. The tank had to be enlarged. " A stream of bulletins, increasingly frenzied in tone " went to the Duke, who was in Ireland. The leaves were 4 feet ; 4 feet 5 inches. And then a frantic letter goes out, " Victoria has shown flower". The following year there were 140 leaves and 112 flower-buds, and complete sensation in the gardening world.

The problem then was that of accommodation, and a new Lily House had to be designed. It was built entirely of glass and iron, 61 feet long and 49 feet wide, and Victoria's tank was 33 feet in diameter. The roof was capable of regulating the amount of light and heat, the columns were also drain-pipes for rain water and condensation, the floor was a ventilator and a dust trap. The building was in fact the prototype of the Crystal Palace, and perhaps it was unfortunate for us that it led its creator more and more into architecture and business with less time for horticulture. Within a year, that famous first sketch for the Great Exhibition Building was to be outlined on blotting-paper in the Board Room of the Midland Railway and Joseph Paxton was to move on to new and wider fields.

But his influence on horticultural glasshouses was never to be lost. And although many others were also at work, he above them all showed the main lines for future progress and broke many ill-founded, old-fashioned beliefs. His use of lighter timbers and larger glass, the introduction of machined and standardized parts, the first attempt at pre-fabrication, and his studies of ventilation, light and heat, made construction easier, more economical and efficient, and ensured better growing conditions.

At about the same time as fame was earned by Joseph Paxton, popularity came to a previously despised fruit. Without any serious explanation, the Love Apple changed its name to Tomato and enjoyed a demand which required year by year an ever-increasing area of glass. To a large extent the two things were complementary ; the improved glasshouses produced better tomatoes and better tomatoes appealed to the public, so that more glasshouses were necessary to meet the demand. Similar progress was shown by other crops, especially peaches, grapes and flowers, and the general demand for good quality produce rose steadily with the growing wealth created by the industrial expansion of the time.

The Spread of Glass Worthing, North London, the Lea Valley, Swanley, Blackpool and the Middlesex areas were all developed in turn between 1860 and 1880. Hampshire, Yorkshire and Lincolnshire followed, and with the beginning of the new century practically every county had some area of glass.

Today, a hundred years after the Great Exhibition was held in Paxton's great glass palace, there are more than 4,500 acres of commercial glasshouses in the United Kingdom. They provide regular and highly-paid employment for some 30,000 workers, and the annual value of their output is approximately £20 millions. Within these hundred years, the annual production of tomatoes has risen from nothing to more than 100,000 tons, and of cucumbers to well over 20,000 tons. Over 200 acres are devoted to carnations and roses, and during their season, chrysanthemums occupy some 600 acres. The area and the output have increased steadily and will, no doubt, continue to do so as methods improve and knowledge increases. The limits may yet be far away, for although much has been learned, much still remains to be discovered and shared by all. Paxton's crest bears the motto, *Nemo solus sapit*.

COLORADO BEETLE IN ENGLAND, 1950

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In 1949, a year when the Colorado beetle was at a low ebb on the Continent, no breeding colonies of the beetle were found in Britain, thus showing the Ministry's policy of extermination to be successful. But vigilance and precautionary measures were unrelaxed in 1950.

THE number of breeding colonies of Colorado beetles found in England in 1950 was 29, the second highest total so far recorded (there were 57 colonies in 1947). The number of single beetles found was 170. Eradication measures were the same as in previous years and are fully described in an earlier article in this JOURNAL*. In addition to small areas injected by hand with carbon disulphide, a total of 5.8 acres was injected with a large tractor-drawn, mechanically-operated machine. Trap crops of potatoes will be grown this year on the sites where Colorado beetles were found in 1950 and these will be inspected regularly. Precautionary spraying or dusting of potatoes in the surrounding potato fields will be an additional safeguard.

Finds of Single Beetles The first beetle found in England in 1950 (reported January 7) was found in a greengrocer's shop which had handled lettuce from the Perpignan district of the South of France. During the period January 1 to March 15 five more beetles were found, two

* *Agriculture*, May, 1948, **55**, 55.

on lettuce from Spain, two on lettuce from Perpignan, and one of unknown origin.

From March 24 to the end of April ten beetles were found on imported produce : six on lettuce from Spain, one on Algerian potatoes, two on lettuce from Italy and one on grapes. The beetles found on the potatoes and the grapes had probably been imported with other produce.

During May, beetles were found on a variety of imports : two on cauliflowers—(one in a crate from Brittany, the other—a dead beetle—in a cooked cauliflower imported from the Continent) ; two on peas, one on carrots from Italy and one on lettuce from Holland. Two beetles were also found among consignments of potatoes—one from Ireland and the other from Sicily ; investigations showed that these beetles probably came in with other imported produce. Towards the end of the month, most of the discoveries were reported from ships, except for one beetle found in a house, another on a window and a third on a person's clothing. Altogether 22 beetles were reported during May, eight of which were found on ships. The range of these reports and the number of beetles associated with ships from the Continent towards the end of the month, indicated that the spring emergents in Northern France, Belgium and Holland were becoming very active. On May 23 a live beetle in flight hit the steering cabin of a small cargo boat seventeen miles out of Deauville and eleven to twelve miles from the nearest French coast.

In the first week of June the number of beetles reported was 16 ; of these, six were found on imported produce, three on ships, one on a motor-car being unloaded at Folkestone and six (one of which was dead on discovery) on such places as a playing field, a lawn, a garden path and an allotment. Six of these beetles were found in the south-east of England, four of them near the coast.

In the second week in June, 24 single beetles were found—the largest number in any week during 1950. Four beetles were reported from the Dymchurch area, Kent—one actually in the sea, another on a groyne in the sands and a third on the dress of a small girl playing on the sands. Another beetle was found floating on a piece of orange peel at Westcliff-on-Sea. Reports were also received of single beetles in gardens, on clothes lines and allotments, mostly in Kent and Sussex. These finds appear to indicate that there must have been a flight of beetles from the Continent, out over the sea; some of these were washed ashore at Kent and a few were probably able to fly inland. The numbers of beetles found during the latter part of June decreased rapidly from the peak number reported earlier in the month. Altogether 61 beetles were reported during June.

Some indication of the activity of beetles on the Continent during the first fortnight of July was shown by the fact that 12 of the 17 beetles reported were found on ships from the Continent. A further 22 beetles were found during the remainder of the month, mostly on imported produce and to a lesser extent on ships.

During August about 20 beetles were found, 11 of which were on ships, but in September only four live and two dead beetles were reported.

One beetle was found inside the wrapping of a box of Dutch tomatoes on October 29, and the remains of a beetle were found on poplar wood imported from France on November 4.

COLORADO BEETLE IN ENGLAND, 1950

In all, 170 single beetles were reported during 1950, compared with the 224 in 1947. A summary of the 1950 finds is as follows :

Associated with or on imported produce	54
On ships	49
On docksides and beaches	11
Inland on potatoes	12
Inland miscellaneous	33
Odd dead beetles	8
On aircraft	3
	170

Breeding Colonies On June 27 five separate clusters of Colorado beetle eggs were found on potatoes in a garden at Gosport, Hants. After a thorough search 225 eggs and one female beetle were found. On June 30 larvae were found on a field of potatoes in East Sussex. The first adults of the first generation emerging from the soil were reported on July 31 from Wateringbury, Kent. By the end of July, nineteen breeding colonies had been reported, their distribution being : Kent 8 ; Essex 3 ; Hampshire 1 ; Sussex 2 ; Oxfordshire 2 ; W. Suffolk 2 and Wiltshire 1.

Eight new colonies were reported during August and two further colonies were found during the first fortnight of September. Altogether 29 breeding colonies were found in Britain in 1950 (see map on page 138). Of the nine colonies found in the coastal area of Kent, five were around Dymchurch in the Romney Marsh district. It will be recalled that eight single beetles were found on the beaches and around this area in June and July, and it is possible that the colonies in this area may have originated from beetles which were washed ashore and succeeded in flying a short distance inland.

Spraying Campaign For the third year in succession a very large area of potatoes was sprayed or dusted with DDT insecticides as a precautionary measure. The "protected area" comprised the whole of the north of Kent and Surrey, an area extending in a semi-circle around London in Buckinghamshire, Hertfordshire, and Middlesex, and two areas in Essex, one around Harwich and a strip bordering the Thames Estuary and extending from the coast to London. The spraying and dusting in these areas was once again the responsibility of Plant Protection Ltd., acting as agents for the Ministry. The spraying period extended from May until August 9 ; some 19,600 acres were sprayed and 3,850 acres dusted. Emergency spraying measures were undertaken at 21 breeding sites, amounting to an additional 2,929 acres sprayed and 467 acres dusted. In addition to the precautionary spraying done by land machines, Pest Control Ltd. successfully sprayed by helicopter 900 acres around the port of King's Lynn, between July 11 and 13.

Twenty-seven tractor-mounted sprayers and six tractor-drawn dusting machines were employed. A 25 per cent DDT emulsion was used and applied at the rate of 0.42 gallons per acre. The 5 per cent DDT dust used in the tractor-drawn dusting machines was applied at an average rate of 42.8 lb. per acre. As in previous years, tractor and lorry drivers were specially trained for this work, and two special courses, each of four days' duration, were held for the field controllers. It will be readily understood that this work could not have been completed satisfactorily unless the areas to be sprayed had been thoroughly mapped beforehand by temporary inspectors.

COLORADO BEETLE IN ENGLAND, 1950

In 1947, the majority of the 57 breeding colonies found were concentrated in North Kent and to the north of London. It is of interest that the great majority of breeding cases reported this year were found outside the precautionary spraying area, and only two colonies were found in fields that had

Colorado Beetle Breeding Colonies, 1950

been sprayed. Although no firm conclusions can be drawn, it seems reasonable to assume that the precautionary spraying campaign has been of considerable value. This is particularly encouraging in view of the fact that the season was very wet and spraying conditions difficult. Spraying teams were held up for many days, but in spite of this the whole of the "protected area" was sprayed as planned.

Continued Vigilance The year 1950 was distinctly unfavourable for the development of the Colorado beetle, although a comparatively severe attack occurred on the Continent and a number of beetles succeeded in reaching England, some of which laid eggs and produced colonies. It is believed that all the colonies found have been eradicated, but many more might have occurred had it not been for the spraying campaign and the adverse weather conditions. It must also be remembered that in addition to spraying, the Ministry continues to rely on the valuable support it has received from the public and all concerned with agriculture and horticulture. A special team of temporary inspectors is recruited every year and many hundreds of acres of potatoes along our coasts and around ports are searched diligently. Nevertheless, occurrences of the beetles must be expected again this year. The danger is not only that beetles will be imported on plants or vegetables, but that they can arrive on cross-Channel traffic of any kind. The Ministry is therefore particularly thankful for the vigilance exerted by captains and crews of cross-Channel steamers. The Channel has so far proved to be a valuable barrier.

The Ministry also thanks the staff of Plant Protection Ltd. for the thorough organization of the spraying campaign, and Pest Control Ltd. for the helicopter spraying around King's Lynn. Thanks are also due to the police, who, as in previous years, have so readily co-operated, for much of the success of the campaign is due to efficient and early reporting of the beetle.

The campaign for 1951 is planned along the same lines as in 1950, and once again farmers and general public are asked for their full co-operation. Any occurrence or suspected occurrence of the Colorado beetle should be reported at once to the police, officers of the National Agricultural Advisory Service, or direct to the Ministry's Plant Pathology Laboratory, Milton Road, Harpenden, Herts. It is emphasized that if a colony of grubs or beetles is found and reported, nothing more should be done until the arrival of an officer of the Ministry.

FARMING AFFAIRS

More and Better Fodder Circumstances are compelling farmers more and more to grow most, if not all, of the food their animals need. As things are, many animals suffer from malnutrition in winter. We have increased our head of stock without effecting a corresponding increase in their food supply. Far more hay, silage, kale and roots, should be available for the hungry season. This need not in every case necessitate a greater acreage of such crops. There is ample scope for stepping up yields. Take hay, for instance. The average yield for the country is about 18–20 cwt. per acre from meadows, and 25–26 cwt. from leys. We can do much better than this if we really try. So also with silage, kale and other succulent green crops. It is chiefly a question of improving the fertility of the land. We must, of course, aim at quality of fodder as well as quantity. Both silage and kale come nearer to the feeding quality of fresh green grass than does hay plus water, and the production potential of kale in particular is enormous. In many parts of the country the climate is more suitable

for ensilage than for haymaking. But hay has always been a basic food for winter maintenance and for various reasons, including convenience of handling (especially when baled) and marketability, it is likely to remain widely popular.

First of all we need to increase quantity. Leys are more responsive than old grass and will generally better repay top-dressing with fertilizers. For bulk a nitrogenous dressing needs to be given early in the growing season, but to improve quality it is not yet too late for a second application. Recent research shows that an application a week or two before mowing will appreciably increase the protein content of the hay. It also helps the aftermath. But for the highest quality the crop must be cut not later than flowering time, otherwise much of the nitrogen will be passed on to the seeds, many of which will be lost in the handling of the crop. Late cut hay will not only be low in protein, it will also be fibrous and tough. What we need in hay is food in a concentrated, digestible and palatable form. Enough fibre can usually be supplied by oat and other straw.

To make really first-class hay equal at least to the lower grades of artificially dried grass, we must be prepared to cock. Ordinary well-made cocks without tripods may suffice in the south. In the north, the west and in Wales farmers may be able to look out some 7-foot poles and join them loosely at the top, three together ; a hole should be bored in each pole one foot from the ground to take a loop of pliable fencing wire. The loops are intended to hold three cross-pieces which should project one foot beyond the straddled tripod. On these the crop should be built after wilting 12–24 hours. This preliminary drying is quickened by turning and perhaps windrowing overnight to safeguard from dew. The outside of the cock should be carried straight up until near the top. It is then narrowed as much as possible and rounded off, a fork with a long handle being used for topping up. About ten tripods will serve for one acre. So secured with a hollow centre communicating with the outside air at the base, the crop is safe for weeks and it will slowly dry out with all its goodness, its leaves and its green colour practically intact. It is wind rather than sun that makes the best hay. Too much sun leads to brittleness and loss of leaf. Baling from the windrow is another means of securing hay before it would normally be fit to stack. When hay is cut on the early side, wide stacks should be avoided. About 12 feet is wide enough. Salt (about 20 lb. to each ton of crop) if sprinkled over the hay during stacking, will exercise some control over fermentation, and prevent mould.

J. G. Stewart

Farming Cameo: 8. Richmond, Yorks N.R. The Richmond district is bounded on the west by Westmorland and on the north by the River Tees. To the east, it stretches some ten miles across the Great North Road on its course from Darlington to Catterick, whilst the ridge which divides Wensleydale and Swaledale forms its southern boundary. Within its area lie rather more than 1,400 farms, growing 42,133 acres of crops and 74,198 acres of grass, and with no less than 142,000 acres of rough grazing.

In such an area, ranging in altitude from under 100 feet above sea level in the Tees Valley to more than 2,500 feet on Mickle Fell, and comprising

many soil types from moorland peat to heavy Boulder clay, almost every farming system practised in the north of England is represented. The only significant omission is the sugar beet crop, which is precluded because of the distance from the nearest factory.

In Swaledale and Teesdale the farming is typical of the Dales districts generally. A noted stock-rearing district where formerly calves were fed on the by-products of farmhouse cheese- and butter-making, the area is now predominantly dairying, and very few even of the hill sheep farms are without their roadside churn-stands.

The triangle enclosed between Catterick, Darlington, and Greta Bridge is a first-class arable area, where the farms are fairly large and highly mechanized, many possessing combine harvesters and driers. The soils vary from gravel near Catterick to alluvium on Tees-side, and are generally markedly deficient in potash. Although a fair acreage of potatoes is grown, cereals are the principal crops. During the last two years a number of arable farmers have concentrated on pig breeding and feeding, and much of their barley crop is now cashed in this way. East of the North Road the heavy Boulder clay which covers most of Cleveland intrudes into the Richmond district and the proportion of grassland becomes greater. Among the arable crops, beans assume some importance.

Swaledale presents all the problems of the Dales areas in an accentuated form, for in few other parts are such large areas of hill land associated with so small an area of enclosures. Every available acre is mown for hay, and grazing is confined to land which, because of contour and access, cannot be cut. On many farms there are no pasture fields, but instead the right to a certain number of "gaits" or "stints" on a common pasture. A similar system of stinting applies to the sheep running on the fells. The progressive Swaledale Sheep Breeders' Association, formed in 1919, has had a big influence in improving the conformation and the wool of this local breed of hardy hill sheep, and the breed is now steadily extending its range, and tending to displace the Scotch Blackface, particularly on the north-east Yorkshire moors. Losses in the winter of 1947 were disastrous, but by the end of 1950 many flocks were back to their 1946 level.

In the western part of the district only Shorthorn cattle are found, many of the herds being registered Northern Dairy Shorthorns, but in the Croft-Cowton area Friesians and a few Ayrshires challenge the monopoly of the native breed. Attestation is proceeding rapidly, and Upper Teesdale is within measurable distance of becoming an all-attested area. A sub-centre of Shincliffe A.I. station is sited at Croft, and the number of inseminations has doubled within the last year.

A. M. Sutherland,
Assistant County Agricultural Officer

CROP PROTECTION PRODUCTS APPROVAL SCHEME

Applications are now invited for the official approval of proprietary Dinitro-ortho-cresol weedkillers, sodium arsenite weedkillers (solid and liquid forms), pentachlorophenol and sodium pentachlorophenate.

A booklet giving a list of approved proprietary Crop Protection materials may be obtained from the Ministry's Leaflet Room, at 30–38, Chester Terrace, Regent's Park, London, N.W.1.

Ministry of Agriculture and Fisheries, Plant Pathology Laboratory, Harpenden, Herts. April, 1951.

AGRICULTURAL STATISTICS
ENGLAND AND WALES

June, 1950, Agriculture Returns (Final)

CROPS AND GRASS

(*thousand acres*)

DESCRIPTION	1939	1949	1950
Wheat	1,683	1,899	2,398
Barley	910	1,885	1,624
Oats	1,358	1,946	1,835
Mixed Corn	83	670	827
Rye, for threshing	(b)	60	67
Rye, for green fodder	(b)	5	8
Total Rye	16	65	75
Beans, for stock feeding	133	102	109
Peas, for stock feeding	37	36	37
Potatoes, first earlies	56	217	183
Potatoes, main crop and second earlies	398	711	683
Total Potatoes	454	929	866
Turnips and Swedes for stock feeding	396(c)	339	300
Mangolds	210	267	267
Sugar Beet	337	413	419
Rape	53	117	132
Cabbage, Kale, Savoys and Kohlrabi, for stock feeding	94	206	233
Vetches	49	28	36
Mustard, for seed	24	15	28
Mustard, for fodder or ploughing in	24	22	
Linseed	4	58	38
Flax, for fibre		17	17
Hops	19	22	22
Orchards with crops, fallow, or grass below the trees	236	255	260
Orchards with small fruit below the trees	18	13	13
Small fruit, not under orchard trees	29	35	38
Vegetables, for human consumption (excluding potatoes), crops under Glass and Flowers	275	538	517
Fruit and vegetables, not grown primarily for sale	(b)	7(d)	10
All other crops	32	43	28
Bare Fallow	355	301	260
Temporary Grass			
Lucerne	32	(e)	74
Other temporary grasses (including clover and sainfoin)			
for mowing	1,304	2,320(e)	2,103
for grazing	768	1,376(e)	1,382
Total Temporary Grass	**2,104**	**3,696**	**3,559**
TOTAL ARABLE LAND	**8,935**	**13,924**	**13,949**
Permanent Grass for mowing	4,612	2,634	2,755
Permanent Grass for grazing	11,097	7,822	7,742
Total Permanent Grass	**15,709**	**10,456**	**10,496**
TOTAL ACREAGE OF CROPS AND GRASS (a)	**24,643**	**24,380**	**24,445**
Rough Grazing—Sole right	4,179	4,031	3,968
" " —Common	1,361	1,495	1,502
Total Rough Grazing	**5,541**	**5,525**	**5,471**

(a) Excludes rough grazings.
(b) Not separately returned.
(c) Includes Turnips and Swedes for human consumption.
(d) Returned in 1949 as "Fruit and Vegetables grown for consumption by persons living on the holding."
(e) In 1949 occupiers were instructed to include lucerne with the other temporary grasses as one total.

SMALL FRUIT, VEGETABLES, CROPS UNDER GLASS AND FLOWERS

(thousand acres)

DESCRIPTION	1939	1949	1950
Strawberries	18.7	20.1	21.1
Raspberries	4.1	3.8	4.3
Currants, Black	10.4	15.3	16.0
Currants, Red and White	2.3	1.7	1.9
Gooseberries	9.1	6.5	6.7
Loganberries and cultivated Blackberries	2.5	1.0	1.2
Total Small Fruit	**47.2**	**48.4**	**51.2**
Brussels Sprouts	38.0	45.7	43.9
Remaining Spring Cabbage (planted in previous year)		14.2	7.1
Summer Cabbage		10.1	15.3
Autumn Cabbage		6.4	8.1
Winter Cabbage	44.1	13.6	16.4
Autumn Savoys		4.1	5.2
Winter Savoys		12.8	13.1
Kale and Sprouting Broccoli		2.4	2.6
Cauliflower or Broccoli (Heading)	18.9	26.3	24.6
Carrots	16.1	31.8	30.8
Parsnips	(a)	5.4	4.9
Turnips and Swedes	(a)	7.9	7.1
Beetroot	(a)	8.6	8.1
Onions grown for salad	1.7	1.9	1.4
Onions for harvesting dry		6.5	5.4
Beans, Broad	17.8	7.3	5.9
Beans, Runner and French		10.2	10.9
Peas, Green for Market	60.6	51.1	54.6
Peas, Green for Canning	28.0	25.4	24.7
Peas, Harvested Dry		180.2	153.4
Asparagus	2.6	1.7	1.7
Celery	6.7	5.7	5.1
Lettuce	5.9	7.1	8.5
Rhubarb	7.2	9.2	9.4
Tomatoes (growing in the open)	0.2	2.4	2.0
Other Vegetables	(a)	15.3	19.6
Total Vegetables (excluding Potatoes) grown in the open	**247.7**	**513.1**	**489.7**
Crops Grown Under Glass	3.3	4.8	4.7
Hardy Nursery Stock	10.5	9.6	10.5
All Bulb Flowers, not under glass	7.7	4.6	5.3
Other Flowers, not under glass	5.8	6.2	6.8
Total Flowers grown in the open	**24.0**	**20.4**	**22.6**

(a) Not returned.

LIVESTOCK

(thousand head)

DESCRIPTION	1939	1949	1950
Cows and heifers in milk	2,255	2,369	2,448
Cows in calf but not in milk	392	513	503
Heifers in calf, with first calf	459	721	674
Bulls for service	91	100	95
Bulls (inc. bull calves) being reared for service	43	41	40
Other Cattle two years old and over:			
Male Steers	944	454	476
Female		625	667

AGRICULTURAL STATISTICS

LIVESTOCK (*thousand head*) *contd.*

DESCRIPTION	1939	1949	1950
Other Cattle one year old and under two :			
Male (Steers)	1,346	338	406
Female		961	1,038
Other Cattle under one year old (excluding bull calves being reared for service) :			
Male (Steers)	1,242	408	475
Female		1,165	1,192
TOTAL CATTLE	**6,770**	**7,695**	**8,014**
Sheep one year old and over :			
Ewes for breeding	7,160	4,460	4,681
Two-tooth (shearing) ewes	1,477	1,095	1,175
Rams for service	205	129	132
Other sheep one year old and over :			
Male	1,021	531	590
Female		362	410
Sheep under one year old :			
Ram lambs for service	156	69	69
Other sheep and lambs	7,967	5,099	5,319
TOTAL SHEEP AND LAMBS	**17,986**	**11,744**	**12,376**
Sows in pig	(a)	124	143
Gilts in pig	(a)	58	78
Other sows for breeding	(a)	81	86
Total sows for breeding	**449**	**263**	**307**
Barren sows for fattening	(a)	17	13
Boars for service	30	16	19
Young boars being reared for service	(a)	6	9
All other pigs :			
Five months old and over	633	654	597
Two to five months	1,516	725	772
Under two months	888	450	496
TOTAL PIGS	**3,515**	**2,132**	**2,212**
Fowls :			
Six months old and over	23,154	23,959	28,731
Under six months old	29,758	33,033	32,781
Fowls, Total	**52,912**	**56,991**	**61,512**
Ducks, Total	**2,237**	**2,521**	**2,246**
Geese, Total	**584**	**938**	**801**
Turkeys, Total	**693**	**800**	**753**
TOTAL POULTRY	**56,426(b)**	**61,250**	**65,312**
Horses used for Agricultural purposes :			
Mares (including those kept for breeding)	347	199	170
Geldings	202	136	119
Unbroken horses of one year old and over (Light)	110	16	17
(Heavy)		19	13
Horses under one year old (Light)	15	7	6
(Heavy)	35	5	4
Stallions being used for service (Light)	5	1	1
(Heavy)		1	1
All other horses (not entered above)	132	86	87
TOTAL HORSES	**846**	**470**	**417**

(a) Not separately returned.

(b) As a result of war-time controls many small sized holdings were recorded for the first time in 1941. It is estimated that to make the totals prior to 1941 reasonably comparable with later years, some 3 to 4 million birds should be added in England and Wales.

LABOUR
(thousands)

DESCRIPTION	1939	1949	1950
Regular Workers :			
Male, 65 years old and over	375.3	27.1	26.7
„ 21 years old and under 65		411.2	403.9
„ 18 years old and under 21	44.7	47.9	50.4
„ under 18 years old	50.8	41.5	42.2
Total Male	**470.8**	**527.7**	**523.2**
Women and girls	40.3	56.0	52.1
Total Male and Female	**511.1**	**583.7**	**575.3**
Women's Land Army	—	11.2	6.8
Casual Workers :			
Male, 21 years and over	57.4	96.8	97.5
„ under 21 years old	5.9	9.2	9.6
Total Casual Workers	**63.3**	**106.0**	**107.1**
Women and Girls	32.7	47.7	48.3
Total Male and Female	**96.0**	**153.7**	**155.3**
Total Male Workers	**534.1**	**633.7**	**630.2**
Total Female Workers	**73.0**	**114.9**	**107.2**
TOTAL WORKERS	**607.1**	**748.6**	**737.4**

AGRICULTURAL INDEX NUMBERS

MONTHLY INDEX NUMBERS OF PRICES OF AGRICULTURAL PRODUCTS
INCLUDING EXCHEQUER PAYMENTS (UNCORRECTED FOR SEASONAL VARIATION)

BASE 1927–29=100

	1951			1950		
	Jan.	Feb.	Mar.	Jan.	Feb.	Mar.
All Products	280*	276*	262*	264*	257*	248*
Cereals and Farm Crops	251*	257*	262*	222*	227*	232*
Livestock and Livestock Products ..	289*	283*	262*	279	269	255
Wheat	276	276	281	240	241	246
Barley	319	323	323	239	236	231
Oats	248	250	250	233	233	231
Potatoes	207*	217*	226*	205*	215*	224*
Hay	265	256	252	217	217	215
Fat Cattle	210	222	228	211	219	225
Fat Cows	172	180	184	161	168	177
Fat Sheep	214	227	235	214	218	227
Fat Ewes	200	206	215	194	197	206
Bacon Pigs	312	314*	312*	274	274	282
Pork Pigs	269	269	269	253	253	255
Sows	228	228	228	204	204	208
Milk	338*	321*	295*	325	310	285
Butter	114	114	114	86	86	86
Poultry	292	299	302	233	224	226
Eggs	248	248	193	291	243	206
Store Stock †						
Dairy Cows	181	183	181	184	177	167
Store Cattle	203	210	214	206	207	207
Store Sheep	208	231	243	202	217	232
Store Pigs	383	406	419	296	308	336

* Provisional
† Not included in general index.

THE MINISTRY'S PUBLICATIONS

Since the date of the list published in the March, 1951, issue of AGRICULTURE *(p. 592), the undermentioned publications have been issued.*

BULLETINS Copies are obtainable at the prices mentioned from the Sales Offices of H.M. Stationery Office or through any bookseller.

No. 59 The Culling of Poultry (*Revised*) 1s. (1s. 1d. by post)

No. 146 Poultry Breeding (*New*) 3s. (3s. 2d. by post)

No. 147 Electric Fencing (*New*) 1s. (1s. 1d. by post)

OTHER PUBLICATIONS

Smallholdings Centralised Services. L.S.A. Report for 1945-50 and Accounts for 1949-50 (*New*) 1s. 9d. (1s. 11d. by post)

Farm Book-keeping (*Revised*) 6d. (7d. by post)

LEAFLETS Single copies of Advisory and Animal Health leaflets, up to four in any one group, with a maximum of sixteen in all, may be obtained free on application to the Ministry, 36-38 Chester Terrace, Regent's Park, London, N.W.1. Copies beyond this limit must be purchased from a Sales Office of H.M. Stationery Office, price 1d. each (2d. by post) or 9d. per dozen (11d. by post).

Advisory Leaflets

Group II Pests and Diseases of Farm and Horticultural Crops
(a) Insects and Other Pests

No. 284 The Potato Root Eelworm (*Revised*)

Group V Weeds

No. 376 The Control of Weeds in Peas with DNBP (*New*)

Group VI Other Subjects.

No. 124 Pruning Plums and Cherries (*Revised*)

Farm Machinery Leaflets. Issued free and obtainable only from the Ministry, at 36-38 Chester Terrace, Regent's Park, London, N.W.1.

No. 1 Mowers (*New*)

No. 4 Grain Driers (*New*)

Fixed Equipment of the Farm Leaflets. Single copies of any one of the leaflets in this series may be obtained free on application to the Ministry, 36-38 Chester Terrace, Regent's Park, London, N.W.1. Beyond this limit, copies must be purchased from a Sales Office of H.M. Stationery Office.

No. 9 Construction of Farm Grain Silos (*New*) 3d. (4d. by post)

No. 10 Design of Farm Grain Stores (*New*) 3d. (4d. by post)

Other Leaflets. Issued free and obtainable only from the Ministry, at 36-38 Chester Terrace, Regent's Park, London, N.W.1.

Take Care When You Spray ! (*New*)

BOOK REVIEWS

An Outline of British Crop Husbandry (2nd Edition). H. G. SANDERS. Cambridge University Press. 18s.

"Increase the yields of all your fields" and "Plough for Plenty" are now familiar slogans, and in giving full effect to these a sound knowledge of all aspects of crop husbandry is essential. This revised edition offers much food for thought and embodies practical recommendations, which, if acted upon in the same thorough manner in which the book is written will provide much of the additional real food which is so necessary at the present time.

It is fitting perhaps that rotations are dealt with at the outset, particularly in view of the fact that in recent times far too much indiscriminate cross-cropping has been practised, bringing with it foul land, lower yields and diseases of various kinds.

The author rightly stresses the devastation which can be brought about as a result o eelworm infestation, particularly in potatoes and sugar beet, and the need to avoid this at all costs.

Manuring by use of fertilizers and farmyard manure is dealt with in the detail the subject deserves, and it is refreshing to read the axiom that "farmyard manure remains the basis of a sound manurial policy."

In a chapter dealing with cleaning, up-to-date information is given on both chemical and mechanical weed control. The time-honoured practice of doing the right job at the proper time in the successful cropping of heavy land forms the basis for recommendation and advice in respect of all work throughout the season. Light land problems are also discussed at length. Typical examples of a series of operations, quoting approximate dates for the preparation of seedbeds for crops on all classes of land, are given.

In an otherwise most useful chapter on the choice and treatment of seed, no reference is made to the seed treatment of cereals as an effective means of wireworm control. Cultivations, harvesting and threshing are dealt with fully, followed by an all too brief chapter on costs and rates of working. A wider range of illustrations of a specific nature, similar to the first three appearing in the book, could have been included with advantage.

The excellent bibliographies at the end of each chapter will be greatly appreciated by students and farmers who wish to obtain more detailed information on the many aspects covered by this very interesting and informative volume.

G.B.W.

Present-Day Poultry Feeding. CYRIL GRANGE. Bates. 3s. 6d.

Mr. Grange has tackled the well-nigh impossible task of listing and evaluating all the various materials that have been offered for poultry feeding in recent years. The list of available unrationed "foods" is impressive, and there can hardly be any that have been overlooked. The advice given is sound and the author does not hesitate to class as worthless many materials that are widely used.

Mr. Grange is less than fair to the potato which, strangely, is omitted from the chapter on farm food crops. I am aware of the labour problems involved in its use, but in fact the potato can give the greatest weight of starch per acre of any crop. One important aspect is not directly discussed : this is the relationship of nourishment (real food value) and bulk. The digestive tract is limited in size and excessive water, fibre, etc. may prevent the bird eating enough "food" to extract the required digestible materials.

The book does not set out to become a standard work on feeding but it should be of considerable help to the small poultry-keeper who is trying to maintain a small flock on the basic ration. The failings of the book arise from its limited size. It would be all too easy for the unpractised poultry-keeper to add up the percentages of the off-the-ration foods and conclude that coupons are unnecessary ! Some good tables covering this point are included in the final pages, but it could with advantage have been emphasized earlier in the text.

I.W.R.

Fertility and Hatchability of Chicken and Turkey Eggs. L. W. TAYLOR. Chapman and Hall. 40s.

The International Baby Chick Association, who sponsored through its Research Committee the production of this book, has conferred a real benefit to poultry breeders, hatcherymen, research students and teachers of poultry husbandry. The book consists of a series of eight reviews of the literature bearing on fertility and hatchability of fowls' eggs available up to December 1947, in respect of the nutrition of the breeding flock, the formation of the egg, the fertility of breeding males and females, the care of hatching eggs before incubation, the physical requisites for good incubation, the biochemistry, physiology and genetics of the developing embryo, and the problems of disease as they affect the running of the hatchery. Each review is the product of a well-known specialist in that particular field of work and is supplied with an adequate list of references for further reading.

The editor, Dr. Lewis Taylor of California, ends the book with an essay dealing with education and research into problems affecting the fertility and hatchability of fowls' eggs. Though this essay is written in the light of the then prevailing conditions in America, and is primarily meant for Americans, it should, nevertheless, stimulate serious thought among those who formulate and carry into practice the policies of education and research in poultry husbandry in this country, since the upgrading of our teaching and research must be ever in their minds.

The book is undoubtedly a valuable addition to poultry literature. Its principal defect as far as the practical poultry farmer and hatcheryman of this country are concerned, is that the sections are rather condensed, being intended as a basis for wider reading as well as an up-to-date summary, and much of the literature cited is not readily accessible to them, but this criticism need not apply in the case of teaching or research centres, which should take, or be able to borrow, the leading American publications.

The binding and the printing are good and the illustrations, both photographic and diagrammatic, are adequate .The appendix contains a useful "trouble shooting" chart for the hatchery, and a full glossary of scientific terms explained simply.

W.M.A.

The Living Soil (Revised Edition). E. B. BALFOUR. Faber. 15s.

The main theme of the original work by Lady Balfour, published in 1943, claimed that a complete change over to humus and total abandonment of chemical fertilizers would prevent soil erosion, produce more nourishing crops, and eventually do away with most disease. The book contained a great deal of unsupported opinion, but little positive evidence in support of these claims. This latest edition is a revision of the earlier work, with the main theme unchanged.

Subtle differences in nutritive value and resistance to disease which are claimed for compost-grown food are difficult to prove scientifically, but an attempt is being made to prove them in practice. The Haughley Research Trust was founded in 1938 with the object of establishing that there is a close link between the treatment of the soil and its relationship to the health of crops and the animals raised upon it. The Soil Association was later formed and the interest of the Haughley Research Farms transferred to it in 1948. The revised edition of Lady Balfour's book includes some references to results obtained at Haughley—results which will be observed with interest by both disciples of the humus school and sceptics alike.

The book is written with an earnestness that comes from complete conviction, and certainly there is a great deal to be learned about the soil from whatever angle the subject is approached. The author contends that plant nutrition must be studied on a much broader basis if we are to understand the effect on soil and plant life of materials added to enhance fertility. The biologist, ecologist and physicist are concerned equally with the chemist.

Research into modern fertilizer practice has by no means exhausted the problems associated with it, but hypotheses must give way to facts. The overall need of the moment is to produce more food by every means at our disposal, including making full and judicious use of fertilizers. Whatever may be the results of long-term investigation, at Haughley or elsewhere, much of what Lady Balfour has written is in support of a belief and is not an objective study.

T.W.

Soil Survey of Great Britain (Soil Survey Research Board Report No. 1). H.M.S.O. 1s. 6d.

There has been much discussion recently on the problems of land use and the competing claims of agriculture with industry and housing. Much has also been written of the potential productivity of our land and of our ability to support large urban populations with home-grown food to a greater extent than in the past. Yet it is surprising how little is actually known of the land and the soil of which we speak. One of the most difficult problems today is to judge whether an area of land should be allowed to go for development or whether it should remain in agricultural use. It is difficult to decide very largely because we know so little of what lies below the top few inches of soil. It is this problem of the soil profile that the Soil Survey Research Board (under the jurisdiction of the Agricultural Research Council) is now tackling, and this is its first report.

In addition to an introduction by the late Professor G. W. Robinson, it contains reports of surveys carried out in the years 1946-48 for England and Wales, with separate reports for Scotland covering the same period. While the detailed summaries may only be of real value to specialists in the districts that have been surveyed, the publication as a whole is undoubtedly of considerable importance, for it draws attention to a fundamental aspect of agriculture that has clearly received far too little attention in the past. In the inter war years, there was a gradual development of organized soil mapping in a few very small areas, but it was not until 1939 that the Soil Survey of England and Wales came into being, with Professor Robinson as Director ; even then there were only six full time surveyors. The outbreak of war caused a serious break in the work, and it was only officially restarted in 1946, when Dr. A. Muir was appointed Director and the Board moved its headquarters to Rothamsted. But the slow period of growth has been advantageous in that it has enabled a small group of workers to devise standard methods of survey, which are obviously essential when dealing with an area of the size of England and Wales where a large number of individuals will be required if a detailed survey is to be completed.

As Professor Robinson points out, a comprehensive survey is necessary for a variety of reasons. There is the need for extending the fundamental scientific knowledge of our soils, for aiding the farmer in the production of crops, the forester in his growing of trees, and the research worker in his general field investigations. Then there is the need, increasing day by day, for detailed soil knowledge in the planning of new towns, rural development, drainage, sewerage and so on. This report shows that a start has been made, but it is only a very small part of the whole that has been completed, and a larger staff is obviously required if the work is to have any general value in the measureable future. Reading through the report, it does seem that it will be necessary to simplify the method of series nomenclature. In part of Somerset alone for instance, twenty-eight different soil series have been described. If the survey is also to be of value to advisory officers and agriculturists, it would seem that a number of series will have to be grouped, as has in fact been attempted with the Somerset survey, and that some coordination between series in different counties will be desirable. However, with a proper organization now in being, a far greater degree of intergration should be possible, and it is to be hoped that the work will expand to meet the increasing demand for information.

M.H.R.S.

The Geology of Water Supply. Sir Cyril S. Fox. Technical Press. 25s.

This book, which is chiefly concerned with those meteorological and geological considerations which affect rainfall and the subsequent utilization of the water on the surface of the land or underground, is one of a series dealing with water supply and treatment in all its aspects. It is written, so the author tells us in his preface, for the general reader, who is normally the consumer as well as the sufferer in cases of shortage and floods. The subject of water supply is becoming increasingly interesting to the agriculturist and to the rural population, not only because of the greater drive to provide adequate piped water supplies to all farms, but also because of the continual encroachment upon agricultural land to provide reservoir space for the higher urban consumption. Any book, therefore, which enables the general reader to understand the why and wherefore of the controversy is to be welcomed, but unfortunately the early promise of this book is not fulfilled; it tends to become rather too technical and heavy for the average reader. On the whole the book commends itself more to the student aiming at a career in the subject rather than to the casual seeker after general knowledge.

G.H.T.

Trace Elements in Food. G. W. MONIER-WILLIAMS. Chapman and Hall. 30s.

Dr. Monier-Williams is a familiar name among food chemists and his work at the Ministry of Health, where he was chemist-in-charge of the Food Research Laboratory, obviously qualifies him to write a book on trace elements in food. Although its appeal is to those engaged in the food industry, this book should nevertheless be full of interest for teachers and workers in the field of agriculture. The treatment is sound, essentially practical, pleasantly free from hypotheses and leaves the impression of being well-balanced. Each element is dealt with in a separate chapter, each having its own bibliography—a feature which has a drawback in that some references must be repeated. Twenty-six elements, including all those of agricultural importance are dealt with in this way, and finally there are two chapters giving brief notes on elements encountered less frequently. Incidentally, the qualifications for including an element as a trace element is its presence in amounts not exceeding 0.005 per cent.

To those whose interests lie in the realm of agriculture the term "trace elements" immediately evokes thoughts on the nutritional significance for plants and animals of these elements rather than on their possible toxicological effects. Readers will find that the biochemical and nutritional aspects have been accorded adequate treatment; nevertheless with the ever-increasing interest and activity in this field of research, constant revision will be necessary to keep the book up-to-date. For instance, since publication, notable contributions to existing knowledge have been made, particularly on the copper and cobalt nutrition of animals.

Analysts, too, will find much helpful guidance, but, rightly, emphasis is more on principles than on details of analytical methods. The book is in no sense a laboratory manual and does not pretend to be a substitute for existing literature on the subject.

Nowadays, with trace elements very much "in the fashion" Dr. Monier-Williams is to be congratulated on his presentation of trustworthy data, leaving the reader, if he so wishes, to embellish them with his own theories.

E.L.S.

Mushroom Growing Today. FRED C. ATKINS. Faber. 12s. 6d.

The cultivated mushroom was at one time regarded as a luxury to be grown in frames or under the benching by the head gardener. Today it is perhaps the most specialized of all horticultural crops. In the last twenty years it has engaged the attention of research workers, and though a few of the problems confronting the specialist grower have been solved, the main contribution by research has been to expose the fundamental nature of many more problems.

With this background, a small group of enthusiasts in 1945 formed the nucleus of the Mushroom Growers' Association and later the Mushroom Research Association with laboratories near Peterborough. The author of *Mushroom Growing Today* has played a leading part in the early stages of both associations and is today the chairman of both. He is also an experienced and successful commercial grower, so that it is not surprising he has achieved the difficult task of giving instructions on mushroom growing and at the same time directed the reader on a short excursion into its scientific aspects.

The book is grouped into six sections, treating respectively the background of mushroom growing, mushrooms as a sideline, modern specialist requirements, the technique of growing, diseases and pests, and other aspects of growing.

Readers who have no knowledge of mushroom growing will be impressed by the many differences of opinion which exist as to the best ways of carrying out nearly every operation; the author has been careful not to assert his own preferences and has shown tolerance towards the dilettante who wishes to experiment with methods unlikely to be adopted in commercial practice.

For those intending to build a mushroom farm he details nine cardinal points to be considered in selecting a site. Building materials, dimensions and costs are discussed and an alphabetical list of accessories necessary to the mushroom grower, together with the names and addresses of firms from which they may be obtained, is given. Ten chapters are devoted to the technique of growing and these form a treatise on modern commercial practices. They range from the preparation of composts to marketing and sanitation

Established growers will find unusual interest in Chapter 27, in which an outline is given of the Tray System of growing, while Chapter 29 is perhaps the only published post-war reference to the cost of growing. The text is well served by forty-six half-tone plates and a comprehensive index.

H.H.G.

BOOK REVIEWS

Dairy Science (2nd Edition). W. E. PETERSEN. Lippincott. 40s.

Like the dairy industry, modern dairy science covers a vast field, and in this book Professor Petersen has boldly endeavoured to provide a comprehensive text to deal in an adequate way with the, nowadays, very considerable needs of college and university students either taking a general course in agriculture or more specialized courses in dairy cattle management, and milk production and handling. The manufacture of dairy products such as butter, cheese, condensed and dried milks is dealt with in a preliminary way.

The author has, in fact, compressed into the space of some 695 pages an immense amount of valuable and up-to-date information on most of the topics coming into this large field. Second editions of successful text-books not infrequently tend to fall a little out of date; the same criticism can be brought even against some first editions, so rapid is the progress being made in nearly every branch of science. But here Petersen and his editor R. W. Gregory have been well up to their task. Their approach is, frankly, almost entirely an American one; American dairy economics (valuable chapters contributed by Dr. H. C. Trelogan of the United States Department of Agriculture), registration requirements for the various breeds of dairy cattle, methods of milk recording, methods of herd management and feeding—to mention a few of the major items—are described and discussed and, with only a few exceptions, citations of the dairy science literature and references to other texts are American. As the text is intended primarily for transatlantic students, this emphasis can hardly be grumbled at, except perhaps as regards the last item, where the inclusion of more references to original work of extra-American origin might indeed have been advantageous to American students.

From the standpoint of the British dairy husbandman or dairy scientist, this book provides a useful basis of comparison between British and American practice and methods, economics and experience. Marked differences exist in several directions; thus it is stated that in the U.S.A. in 1947 as much as 17.5 per cent of all milk produced was used on the farm for immediate consumption, whilst about 60 per cent was sold for the liquid market. The total production of milk for 1947 (the latest year given) showed no increase over 1942; it would seem that despite the rise in population, milk production may have reached its peak, though liquid consumption rose until 1946, apparently at the expense of butter-making. Daily consumption per head is high—in the Atlantic states it is about one pint.

In the U.S.A., a Holstein Friesian with a black switch is no Holstein Friesian! Other examples of the lengths to which cattle fancying may go—some of which are not without value as warnings to ourselves—are given in Petersen's interesting text. The chapters on the udder, the physiology of milk secretion and "let-down" and the factors affecting yield and quality are, as one expects from this author, stimulating and even provocative, and should not be missed by the dairy physiologist. In fact, to everyone engaged either in the study or the skilled practice of milk production, this book may be strongly recommended.

H.D.K.

The Fruit Grower's Handbook. N. B. BAGENAL. Ward Lock. 10s. 6d.

This book is a condensed version of the more voluminous *Fruit Growing*, which was first published in 1939 and revised in 1945, and became a standard text-book for student and grower alike. The new volume retains all the essential advice on modern fruit culture found in the larger work, in a concise but by no means sketchy form, and a good deal of recent knowledge has been included.

Of special interest is the information on the forming and training of the delayed open-centre type of tree which is receiving increasing attention by commercial fruit-growers at the present time. Very clear drawings have been used to illustrate the various pruning processes involved, and the reader should be able to follow the author's instructions easily.

The information on pests and diseases, so valuable a feature of the older volume, has been brought up to date. Advice is given on the value and uses of DNC, thiocyanate and DDT preparations, the diagnosis of pests and diseases is simplified, and the control measures are clearly set out in a series of quick-reference tables.

Altogether the volume comprises a handy, comprehensive and well-illustrated guide to fruit growing, which by reason of its moderate price will fill the special needs of the student, while at the same time being well worthy of the commercial grower's bookshelf.

E.W.H.

Farm Weeds (Young Farmers' Club Booklet No. 23). JOHN DEARDEN. Evans Bros. 1s. 6d.

Within the compass of 46 pages this latest addition to the well-known series attempts to give some general information about farm weeds, the reasons why they may be troublesome and the general methods of their control. Like its companions this booklet is written in elementary style, but unlike some it fails to maintain their overall excellency.

The author's approach to his subject by way of the importance of plant association is most commendable, since it should form the basis of a clear understanding of weed control, but it is hardly possible to cover this aspect in 1½ small pages.

The section dealing with chemical control of weeds hardly does justice to our present knowledge of this subject. The range of crops that can be treated with selective weed-killers is not given, nor is mention made of such materials as DNBP (for peas and lucerne) nor selective oils (for carrots). It is rather doubtful whether the mention of copper sulphate is justified today in the presence of so many and more valuable materials, and it is unfortunate that no reference is made of the poison hazard in the use of DNOC. Some of the information given under the heading " Hormone Weed-Killers " is a little misleading : for instance, it is not true to say that these weed-killers attack only through the roots, since with annual weeds, at any rate, the greater effect would seem to be through leaf absorption ; further, whilst they can on occasions be highly selective in their effect as between crops and weeds, it is more usual to find a graduation of toxicity as between "unaffected" and " seriously affected".

The booklet concludes with a comment on the value of weeds in certain circumstances, the legal position regarding weeds and weed seeds, and a list of useful books for reference. Over thirty illustrations are included—some of them excellent.

The confusing reversal of the captions to Figs. 2 and 3 should be corrected on reprinting.

C.V.D.

Swine Management. A. L. ANDERSON. Lippincott. 24s.

A new book on any technical subject can either " fulfil a much-felt want " or be a " welcome addition to the book-shelf". *Swine Management* by Arthur L. Anderson definitely falls into the latter class, for the British reader at any rate. Some works may be regarded as reference books for those making a serious study of their subject, others as a complete handbook for the practical operator. This comes between the two.

With the thoroughness, the systematic layout and the logical treatment which is so often found in American technical works—and especially those from Lippincott—the author deals in some five hundred pages with each facet of pig husbandry in turn.

This book, the author writes in the preface, was written to take the place of *Swine Enterprises*. Much of the matter of that book has been reproduced in this present publication. The author has " endeavoured to cover in a simple and concise manner the available information pertaining to swine husbandry and make it usable to the student. Only that which has been fairly well established by experiment and experience is included." Naturally, the subject is treated from the American point of view and the conditions discussed are American. As a result, much of the matter is not of direct importance to the average British student of pig-keeping, but to the reader with a world-wide interest in the pig, this book gives a thorough insight into the industry and practice in the United States.

Generally the source of information is indicated only briefly, such as " At the Minnesota Station it was found that . . . etc." In this respect *Swine Management* falls short of being the student's book of reference. Detailed references at the end of chapters to the original publications quoted would have greatly enhanced its value for the student. For the reader wishing to get practical information on the handling of a pig unit, there is indeed an enormous amount of good, sound, instruction. But as a book from which such a reader would gain confidence in what he was doing, a great deal of the more academic material could have been dropped to make space for a little more thoroughly intimate advice, such as where and when to scratch a sow's back.

An excellent collection of almost 200 photographs and an adequate index add to the attractiveness of the book. A few printing errors occur, and they are apt to be misleading. A second edition should, however, put these in order.

In view of two thoroughly good recent additions to the list of British books on pigs, *Swine Management* cannot be recommended as an essential handbook for those only generally interested in this subject. But to those who are deeply and widely interested, and who already possess a miniature library on the subject, this book would definitely make a " welcome addition to their book-shelf."

W.A.B.

Tulipomania. WILFRED BLUNT. King Penguin. 3s.

Financial speculation is a commonplace of economics, although it has not gone unchallenged on ethical grounds ; certainly not where the mind of the general public has been fired with the buoyant optimism of easy money. History records not a few examples of these get-rich-quick fevers ; in England, that culminating in the South Sea Bubble is perhaps the best known of them.

The craze for tulip bulbs which swept Western Europe after their introduction from Turkey in the middle of the sixteenth century and the fantastic trading which accompanied it is briefly described in this book by Mr. Wilfred Blunt, art master at Eton College. In Holland, tulipomania, as it has come to be called, was at its height between 1634 and 1637, and became a colossal gamble to exploit the enthusiasm of Dutch amateurs, many of whom were willing to pay thousands of florins for a single bulb—which might or might not, because of the habit of "breaking," prove to be what was claimed for it. But with a few breeder tulips and a small garden, there was always the chance of making a fortune. As the craze mounted in intensity, property and estates were mortgaged, and in one town alone deals amounting to ten million pounds were made during the three years that the mania lasted. The "epidemic" reached England almost a century later, but in a less rabid form.

In Turkey, its eastern home, tulip culture was as avid as in Holland, but less marked by financial swindling. The tulip fêtes of the Turkish court in the eighteenth century had all the splendour of Asiatic ostentation and, on occasions it seems, induced not a little jealousy and heart-burning in the harem.

By those to whom the subject is new, Mr. Blunt's short account of a romantic interest in one flower that was not " born to blush unseen " will be read with interest—even incredulity. The book is tastefully printed and illustrated by sixteen colour reproductions from Alexander Marshal's water-colour originals, now preserved in the Royal Library at Windsor.

S.R.O'H.

The British Sheepdog. SYDNEY MOORHOUSE. Witherby. 12s. 6d.

The working collie has so many friends and admirers that this attractive book will be widely welcome and read with enthusiasm. Most will be pleased, on the whole, with what they read, and be delighted with the photographs.

For many years the author has kept his eyes and ears open at sheep-dog trials, and has been privileged to go behind the scenes to hill farms and supper-tables, where belts and tongues are loosened. As a result, he is able to shed many side-lights on prominent sheep-dog men, and on famous dogs, past and present. Interspersed with bits of sheep-dog history, glimpses of trial runs, incidents from everyday work in the hills, training hints and handlers' outspoken comments. Mr. Moorhouse's account will bring a breath of mountain air to the general reader, and it will be of special interest to those who know personally the men and dogs referred to.

Descriptions of a trial run, however, whether the author's own or the semi-official version, are not enlightening, and it is confusing to find that the plans given do not conform to the text. This is unfortunate, and is worth correcting, since a better understanding by the public of what man and dog are trying to accomplish would lead to a keener appreciation and better enjoyment.

The section on our British breeds of sheep is interesting and informative ; it confines itself mainly to the hill breeds, as is only right where dogs are concerned. The notes on certain breeds that are in danger of extinction may save them from being altogether lost to memory. The other material is of a general nature, and it would be unreasonable to expect one man to write authoritatively on all the breeds, scattered as they are over inaccessible country.

The concluding chapters describe other breeds of sheep-dogs and their uses ; there are notes on "doggie" film stars, railway track patrols, and guide dogs. The Border Collie abroad gets an appreciation, and details are given of the U.S.A. Certificate of Working Ability, into which it is amusing to try to fit one's own dog.

W.R.S.

BOOK REVIEWS

The Face of North-West Yorkshire. ARTHUR RAISTRICK and JOHN L. ILLINGWORTH. The Dalesman. 5s.

Within the compass of 106 pages, this pocket-size book deals with the origin and character of the Dales and gives a general survey of the vegetation and climate of North-West Yorkshire. An attempt to cover so much in such limited space, must necessarily be in general terms. The authors have, nevertheless, succeeded in creating a full and effective picture of a district of great scenic and diverse character, ranging from the long, deeply cut valleys of Wensleydale and Swaledale to the wild country penetrated by the Upper Ribble, Wenning and Greta rivers and dominated by the high peaks of Ingleborough, Penyghent and Whenside. Also included are the Craven lowlands and the rolling, swampy, heather moors of the Millstone Grit on the east and the south.

It is an enjoyable book and I have learned a great deal from it, but the agriculturist is likely to have to turn to the second part of the book before becoming really interested in the earlier chapters.

T. C. C.

Horse Keepers Encyclopedia. W. H. WALTER. Andrew George Elliott. 5s.

Within 190 pages, the author has provided a handy reference book for horsemen of all sorts, but more particularly perhaps for the smaller horsekeeper rather than the established farmer and breeder. He gives among other things a brief description of the useful breeds of horses and practical and scientific information as to stabling, grooming, shoeing, and feeding them. Four chapters are devoted to the main diseases and ailments to which these animals are subject, along with useful suggestions for dealing with them.

Overlaid, as the subject of horse management is, by custom and tradition, it is inevitable that not everyone will agree with all Mr. Walter's recommendations; for instance, his advice about the use of linseed oil for the treatment of colic, vitally important though this medicine is for stomach complaints. In all cases it is sound practice to administer linseed oil on the first signs of any kind of colic, as a safeguard against stoppage and the recurrence of the complaint ; not, as the author suggests, in treating flatulent colic only. Mr. Walter states that the horse's head should be held high for drenching, but he does not mention any of the usual methods employed.

There is a four-page index, and the book is usefully illustrated.

T.J.W.

The Fruit-Grower Year Book 1951. Benn. 10s. 6d.

The new issue of this useful handbook follows closely the lines of last year's, and contains much information of value to the fruit-grower, from both the technical and business standpoints.

D. H.

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